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VIEWS, NEWS AND INTERVIEWS.

The interest in the electric railway question in England has extended as far as the question of trolley-car etiquette, as will be seen from this quotation from a London contemporary: "We are told that another peculiarity of the American street cars is that ladies are not allowed to stand in them. When a lady enters a crowded car a seat is promptly vacated for her convenience. No doubt this is sometimes done even in England, but rarely in the same way, with the result that while here it is recognized as courtesy and thankfully acknowledged, there it is taken as a right, for which no thanks are necessary."

A cable dispatch from Caracas, Venezuela, states that a New York firm has made a contract with the city of Caracas by which an electric light, heat and power plant will be established in that place. Current will be generated at the water-falls of Macuto.

According to the latest information received from Japan by the ELECTRICAL REVIEW, there are at the present time three electric railways in that empire. Work on four other roads will begin about the middle of September. One of these will be an electric railway about 50 miles long, running through a number of small towns in the vicinity of Kobe. Current for the line will be generated by water-power. Nearly all the apparatus for these four new roads has been purchased within the past few months in the United States.

The Fifth Avenue Stage Coach Company, of New York city, is investigating the matter of horseless carriages, having become convinced that the stage horse is doomed to follow in the wake of the street-car horse. Electric cabs have been in public service in New York city for several months past, and have come to be regarded as an accepted fact by the inhabitants of the metropolis. A public cab service was recently inaugurated in London, which has already proved to be a great success. Electric cabs in New York have ceased to cause comment when seen on the street, and it seems that the Fifth Avenue Stage Company is already following in the proper line of progress in deciding to adopt horseless carriages.

In the shower of titles and decorations conferred during the recent jubilee celebration of Queen Victoria, men of science who have contributed largely toward the progress of the human race during the past 60 years were almost wholly overlooked. The jubilee honors were conferred principally on those engaged in the government—civil, military or naval—services. No scientific man secured one of the six peerages distributed at that time, and of the fourteen baronetcies created two were awarded to physicians. Professor Crookes, who is well known to all electrical workers, was the only scientific man included in the list of 22 new knights. While this state of affairs may appear unusual to Americans who are ignorant of royal honors, yet it but follows the policy which Great Britain seems to have established in the past. Faraday, Watts, Hughes, Swan and Preece are all names of prominent scientific workers whose merit has never been recognized by the bestowal of royal honors.

The funeral trolley car has been steadily making its way, and its general adoption would seem to be only a matter of time. An improved car, made for such service in Cincinnati, which takes the place of a number of mourning carriages ordinarily necessary, is said to be an immense boon to people of limited means. In Cincinnati, for instance, a hearse costs $8, and five carriages, which would be necessary to carry 20 people, would cost $4 each, or $20, making $28 in all. This item should now be reduced by at least one-half. While in this country the street car would probably not be looked upon as meeting the requirements of a great public funeral, in the city of Mexico all the attendants at state obsequies travel to and from the cemetery in street cars, and, while the funeral procession is in progress, all the other traffic of the line is stopped.

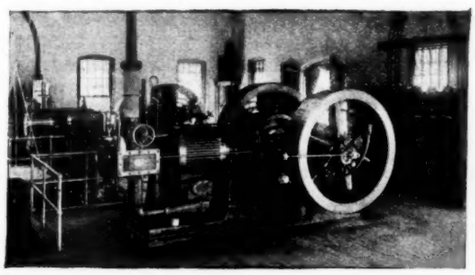

FIG. 1.—INTERIOR VIEW CHARLESTON CITY RAILWAY COMPANY'S POWER-HOUSE, SHOWING DIRECT-CONNECTED BALL & WOOD ENGINES AND GENERAL ELECTRIC GENERATORS.

The recent report that the Postal Telegraph-Cable Company had acquired the Mexican Central telegraph line is incorrect. They have simply entered into a mutual agreement for the interchange of telegraph business at El Paso, Tex., and Laredo, Tex.

Electrical yachtsmen have extended their sympathy to superintendent A. K. Banta, of the Hudson County Electric Light Company, of Hoboken, N. J., whose steam yacht "Adele" went ashore last week on the western side of Hoffman Island. Mr. Banta's family was aboard the yacht, and was transferred to a fishing smack, which landed them in New York city. The yacht floated off at high tide, the only damage sustained being a disabled rudder.

THE CHARLESTON, S. C., CITY RAILWAY COMPANY.

A DESCRIPTION OF ITS POWER-HOUSE AND CAR BARN—A FINE EXAMPLE OF GOOD CONSTRUCTION.

The following description and the accompanying illustrations give the complete details of the interesting plant operated by the Charleston City Railway Company, in Charleston, S. C., and installed for them by J. G. White & Company, Incorporated, of New York city. The plant is not described by the ELECTRICAL REVIEW for any other reason than that it seems to stand as a splendid example of high-class engineering and honest contracting, combined to give a comparatively small city the best that can be had in the way of a street railway system.

The car house is located on a lot 184 feet by 312 feet, at the corner of Meeting and Pointset streets. It is built of brick, and its outside dimensions are 255 feet 3 inches by 67 feet 8 inches. An office building 71 feet 4 inches by 17 feet 4 inches is built alongside car house. The distance from top of rails to under side of roof trusses is 18 feet. The car room is 209 feet 4 inches by 65 feet, and there are armature and store rooms and a repair shop at the rear end of the building. The main car room contains three pits, each 100 feet long, and the repair shop contains two pits 26 feet long. The elevation of the floor of the car barn is 11.5 feet above low tide.

On excavating for the foundations, water was encountered a few feet below the surface, and the ground was found to be a fine sand, mixed with loam, and of very little supporting power. To avoid piling, the foundations were not carried more than two and one-half to three feet below the surface. Test pits, excavated to a depth of six feet, led to the conclusion that shallow foundations would be likely to cause less trouble from settlement than deep ones.

Under all the exterior walls there was laid a footing of Portland cement concrete 3 feet 4 inches wide and 2 feet thick. On this concrete footing the brick footings were laid, and

the structure was completed in the usual manner—no other precautions being taken to prevent settlement or cracking of walls.

Below the ground line all the brick work was laid in cement mortar, and above the ground line in lime water.

All the interior partition walls are brick and rest upon concrete footings, similar to those under exterior walls. The walls of pits are brick, laid in cement mortar, and all pits have concrete bottoms.

The floor of the car room and the floor of the paint shop are concrete, with a finishing coat of Portland cement mortar, troweled smooth and flush with the tops of the rails. All exterior walls are 12 inches thick in panels, and are 20 inches thick at pilasters. The roof trusses are steel, and the roof covering is No. 20 corrugated iron. A monitor 27 feet wide extends the whole length of the building, and all sashes are arranged to be opened and closed from the floor.

The interior walls are kalsomined, and the trusses and under side of corrugated covering are painted a light color.

The car house contains five tracks, 11 feet 6 inches apart, center to center, and the center of one side track is 12 feet from side wall of building to allow room for convenient handling of repair parts, and to form a passageway to rear of car room.

The office building contains superintendent's office, conductors' and locker room, and shower baths. Basins and shower baths have been liberally provided for the purpose of encouraging personal cleanliness on the part of the employés.

The power-house is located on a lot 300 feet by 355 feet, fronting on Meeting street, and extending from Centre street to Coolblow street. This lot is directly opposite the lot on which the car house is built, and about half the lot is under water.

In designing the power-plant the object aimed at was to secure a thoroughly substantial and reliable plant, with the least possible expenditure of money. The building is a plain, substantial brick structure, designed for the sole purpose of housing the machinery.

The power-house is 85 feet by 68 feet 4 inches, and contains a boiler room 45 feet by 65 feet, and an engine room 36 feet by 65 feet. The exterior walls are brick, 16 inches in panels and 20 inches thick in pilasters. The foundations and concrete footings are similar to those of a car house. The partition wall between the boiler and engine rooms is brick, 12 inches thick, with pilasters 16 inches thick. The clear height between floor of boiler room and under side of roof trusses is 22 feet. The engine room floor is 4 feet 6 inches above the boiler room floor. The roof trusses are steel, and the roof covering is No. 20 corrugated iron. The roof is continuous over both the engine and boiler rooms, and a monitor 27 feet wide extends nearly the entire length of the building.

The floor of the engine room is constructed of 10-inch by 12-inch joists on brick piers; the under floor is 4-inch thick plank, and the top floor is 1-inch maple. The floor of the boiler room is brick, laid on edge on a 4-inch thick bed of concrete and grouted flush.

All interior walls are rubbed smooth and kalsomined in a light color. That part of the roof over the engine room is ceiled with hard pine, nailed to spiking pieces, which are bolted to the steel purlins, and the ceiling is finished in hard oil finish.

The boiler room contains two 200-horse-power Babcock & Wilcox boilers, set in one battery, and one 200-horse-power Babcock & Wilcox boiler, in a separate setting. Provision has been made for two 300-horse-power Babcock & Wilcox boilers, which will be installed later. There are two Deane 7½-inch by 4½-inch by 10-inch duplex boiler feed pumps, and one 7½-inch by 6-inch by 10-inch duplex tank pump. The engine room contains two Ball & Wood 14-inch by 27-inch by 16-inch tandem compound-condensing engines, and two direct-connected 200-kilowatt General Electric generators, running at 200 revolutions. The foundations for the engines are carried on piles, about three feet apart and "driven to refusal." Piles were also driven for foundations for a 500-horse-power engine to be installed later. The heads of the piles under each engine are incased in a bed of Portland cement concrete 3 feet thick, and forming footings on which to commence the brick foundations proper. The footings for the partition wall between engine and boiler room are carried about eight feet below the floor of the boiler room, and form one wall of the condenser pit in the engine room.

A bridge spans the condenser pit at the point at which the valves in the injection, priming and steam pipes are located. The steam supply to the condenser is led around so that all the valves controlling the operation of the condenser are located within easy reach of the operator when standing on the bridge referred to. A valve is also placed in the steam pipe close to the condenser, so that its operation may be controlled from floor of pit.

The exhausts from the condenser and from all pumps discharge into an auxiliary exhaust pipe which connects with a 600-horse-power vertical Goubert supplementary heater, set in boiler room, and with the atmospheric exhaust. The main atmospheric exhaust pipe is 14 inches in diameter, and extends above the roof of the power-house, where it terminates in a condenser head.

All drips from the high-pressure steam system are led to a Deane receiver and duplex plunger pump, which automatically returns to the boilers the water of condensation. The feed-water piping is 3-inch, extra heavy, and is arranged to pass the feed water through the primary

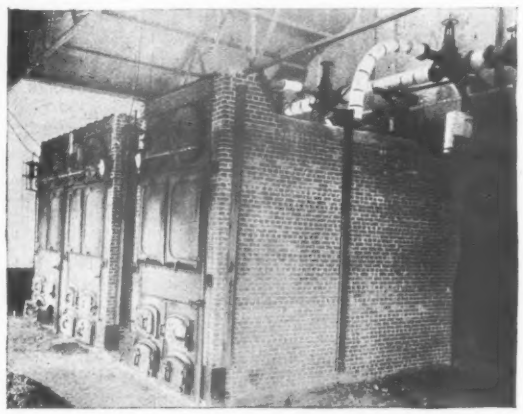

FIG. 2.—BOILERS IN THE POWER-HOUSE OF THE CHARLESTON CITY RAILWAY COMPANY.

The walls of the condenser pit are brick, laid in Portland cement mortar, and the bottom is Portland cement concrete 18 inches thick. Owing to the bottom of the condenser pit being level with high tide, and at least three feet below the ground water level, it was necessary to construct it water-tight and to provide a steam ejector for removing any water which might escape from the pumps and condenser.

The walls of the pit are independent of engine foundations. The condenser is a 14-inch by 22-inch by 24-inch horizontal single Deane jet condenser. The boilers, piping, engines and auxiliaries were designed to be operated under 175 pounds steam pressure. All piping is full weight standard pipe, or extra heavy, and all steam fittings larger than two and one-half-inch are gun iron, having a tensile strength of not less than 29,000 pounds.

Stratton separators are used on the steam pipes to the engines, not so much to take care of condensation as for protection against possible priming due to bad water.

There is one 600 horse-power vertical Goubert feed-water heater in the condenser pit, and the exhaust piping from the engine is arranged so that the exhaust may be passed through the primary heater and condenser, or through the primary heater to the atmospheric exhaust, or directly to the condenser, or directly to the atmospheric exhaust.

The injection water inlet to the condenser is 19 feet above the supply. A four-inch priming pipe connects with the general water supply system and enables the condenser to be readily started.

and supplementary heaters, or through either of them, or directly to the boilers. Owing to the fact that the best feed water obtainable contains a large amount of salt and scale, forming impurities, provision has been made for installing a feed-water purifier later, if it should be found necessary to do so. In the engine room there is a gauge board, having steam and vacuum, needle and recording gauges.

There is a steel chimney 125 feet high and 7 feet diameter at top, erected on one side of boiler room, about five feet from building, and a plate-iron breeching connects the boiler settings with the chimney. The main damper in the breeching is controlled by a Spencer automatic damper regulator, placed in the engine room. The steel chimney is lined throughout, and the flaring bottom section is filled in solidly to increase stability. The chimney foundation consists of piles, capped with a bed of concrete 21 feet square, supporting the brick base as shown.

A 30,000-gallon wooden tank, erected on a wooden tower 20 feet high alongside power-house, supplies feed water for boilers. A 30,000-gallon wooden tank, erected on a steel tower 39 feet high alongside the car house, furnishes water supply for car washing and fire protection; two and one-half-inch hose valves are located in the car house and in the power-house. The discharges from the three pumps in the boiler room are so arranged that any one, or all, of the pumps can be used to feed boilers or to pump into either of the tanks and in fire protection system of piping. The tank on the 39-foot tower alongside the car house is supplied through the general fire protection system of piping. The six-inch rising pipe in the manhole connects directly with the bottom of the tank alongside car house. The two and one-half-inch general supply passes through bottom, and terminates about eight feet above the bottom of this tank. This two and one-half inch general supply supplies water for car washing and other purposes, and the object in carrying it eight feet above the bottom of the tank was to prevent the possibility of the tank being emptied through this pipe, leaving no water for use in case of fire. In order to obtain for fire purposes a head of water due to a 100-foot tank tower, and at the same time the difference in cost between a tank on a 100-foot tower and one on a 39-foot tower, the arrangement of piping used in the manhole was devised. With all hose valves closed, the pumps deliver into the fire protection system of piping until the pressure reaches 50 pounds, at which pressure the automatic relief valve opens and the water passes through it and into the tank, through the six-inch rising pipe. In case of fire, occurring at a time when the pumps are not delivering into the fire protection system of piping, on opening any of the hose valves water would be supplied from the tank through the six-inch horizontal swinging check valve shown, until the pumps were started and delivered more water than could be discharged through hose, when the horizontal swinging check will close, and the pressure rise to 50 pounds, and the surplus water pass through the relief valve to the tank. In case of an accident to the pumps during a fire, the horizontal swinging check valve would render all the water in the tank available, but under reduced pressure. Each hose valve is provided with 100 feet of two and one-half-inch hose and one-inch nozzle, with the exception of the two hose valves in the engine room. The two hose valves in the engine room turn down and discharge directly on the floor. A base about four inches high has been constructed around condenser pit to support railing, and to act as a dam in case it should be necessary to flood floor of engine room on account of fire. The floor of the engine room being the only combustible part, provision was made for flooding it and hose excluded.

The Phœnix Carbon Manufacturing Company.

Col. S. G. Booker, superintendent of the Phœnix Carbon Manufacturing Company, of St. Louis, announces on another page of this issue of the ELECTRICAL REVIEW that his company owns patent No. 500,284, covering carbon galvanic batteries, and notifies the trade and the public in general that his company is prepared to vigorously protect its rights under that patent. The Phœnix company, in addition to manufacturing a complete line of arc light carbons, motor brushes, and everything in the carbon line, has made a specialty of battery carbons for many years past. Its plant is well adapted to making not only standard forms and sizes, but its facilities are such that special work can be turned out with accuracy and promptness. Colonel Booker is well known in the trade and is one of the most popular men in the business. The products of his company are as well known and as popular as he is, which is saying a great deal.

ON SOME NEW FORMS OF GAS BATTERIES AND A NEW CARBON-CONSUMING BATTERY.

READ BEFORE THE ELECTRICAL SECTION OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, TORONTO, ONT., AUGUST 24, 1897, BY WILLARD E. CASE.

In 1839 Grove announced his discovery of the gas battery, considering it the most simple arrangement to produce electricity. He never considered it a practical way to generate electrical energy. Grove used platinum sponge or platinum black as the absorbent to facilitate the combination of the gases. The following experimental determinations by the author will show, as far as they extend, that platinum or its compounds are not necessary to produce the combination of the gases in the production of electrical energy, so doing away with one of the most expensive drawbacks to the gas battery. The experiments also prove that carbon is oxidized to CO_2 at normal temperature without the application of heat with the production of electrical energy.

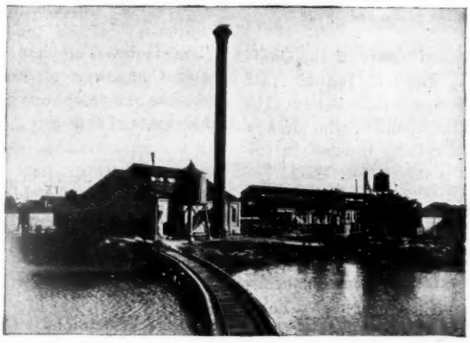

FIG. 3.—GENERAL VIEW OF THE POWER HOUSE AND CAR BARN OF THE CHARLESTON CITY RAILWAY COMPANY.

In these experiments it will be noted that platinum is not essential to the reactions. Both electrodes in each case can be carbon tubes or plates. The physical condition of the carbon in its many forms plays a most important part.

The Chlorine-Carbon Cell—A porous carbon-tube electrode into which chlorine gas was passed, opposed to a carbon rod which had been heated red-hot, was placed in hydrochloric acid, of specific gravity 1.10. An electro-motive force of from 0.50 to 0.54 volt was obtained, depending on the condition of the carbons.

The carbon electrodes, after being heated, were again assembled and placed in distilled water. With no gas passing through, they gave an electro-motive force of 0.00. When the chlorine gas was passed into the carbon tube, at slightly above atmospheric pressure, the electro-motive force gradually increased to 0.44 of a volt at the end of 26 hours. On short circuit 0.04 of an ampere was obtained, but it dropped rapidly to 0.02. The internal resistance was very high. The electrodes were taken out and the solution analyzed. It was found to contain hydrochloric acid and carbon dioxide. The same experiment was repeated in a dark case to see if the action took place in the absence of light. The chlorine gas was made in the dark and passed through the electrode. The electro-motive force gradually increased, as in the first case, showing that the action took place in the dark.

A carbon electrode, through which chlorine was passed, and a negative platinum electrode opposed to it in dilute hydrochloric acid gave 0.40 of a volt, but the electro-motive force did not hold up through the voltmeter circuit. Both electrodes were covered with gas after short circuiting, and the electro-motive force dropped to 0.24 of a volt. On shaking, the voltage jumped to 0.40.

A negative carbon electrode was substituted for the negative platinum. It had been heated red-hot and was very porous, the surface soft and rough. The electro-motive force reached 0.58 of a volt, and gave on short circuit 1.24 amperes, but dropped slowly to 0.30. The negative carbon electrode was oxidized.

A platinum electrode in a paper envelope, opposed to powdered carbon in the bottom of a glass jar in hydrochloric acid, chlorine being passed into the solution near the platinum. An electro-motive force of 0.60 of a volt, and on short circuit 0.90 ampere, was obtained. The current remained fairly steady. The surface of each electrode was about 45 square inches.

A cell made up as above, but with graphite instead of carbon, gave 0.54 of a volt, but dropped rapidly on short circuit, the graphite not oxidizing fast enough to give a steady current.

A dense carbon rod opposed to powdered carbon gave 0.40 of a volt, and on short circuit 0.20 of an ampere. The rod was incased in filter paper to protect it from floating particles of powdered carbon, and the chlorine passed into the solution near it.

Two small glass beakers connected by an inverted U tube and containing hydrochloric acid, with a carbon rod in one and platinum plate in the other. When chlorine was passed into the vessel with the platinum, an electro-motive force of 0.48 volt was obtained. When chlorine was passed into the beaker containing the carbon rod, an electro-motive force of 0.14 was obtained, but it dropped almost immediately to 0.00. When chlorine was passed into both beakers, no electro-motive force was obtained.

The chemical reaction of the chlorine-carbon cell was as follows:

$$H_2O + Cl_2 = 2H\,Cl + O.$$

The oxygen of the decomposed water attacking the carbon, and hydrochloric acid and carbon dioxide being formed.

Carbon Monoxide—Chlorine Cell—Cell made as follows: A glass tube, 2.25 inch bore and six inches long, corked at each end, with a porous tube, one inch outside diameter, passing through the glass tube and corks, and corked at each end, carbon rods and gas inlet and outlet tubes let into each chamber, which were filled with dry animal charcoal previously treated with hydrochloric acid. The porous tube was saturated with concentrated hydrochloric acid. Chlorine gas was passed through the outer tube. An electro-motive force of 0.18 volt was obtained. Then carbon monoxide gas was passed through the inner tube, and the voltage increased to 0.38 volt. A slight increase of the pressure of the gases increased the voltage. The glass tube became hot. This reaction would produce carbon oxychloride.

Marsh Gas—Chlorine Cell—Two carbon tube electrodes, three-fourths of an inch in diameter and four inches long, opposed to one another in a solution of hydrochloric acid, with chlorine passed into one and marsh gas into the other, gave an electro-motive force between 0.60 and 0.70 volt, varying with the condition of the carbon. A current of 0.70 ampere was obtained on short circuit, but the cell rapidly polarized. Afterwards fresh carbon electrodes, with the gases passing through them, were placed in distilled water, and the electro-motive force gradually increased from 0.00 to 0.14 in 12 hours.

On testing the solution hydrochloric acid and carbon dioxide were found to be present. The chemical reaction of this cell is as follows:

$$CH_4 + 4Cl_2 + 2H_2O = CO_2 + 8H\,Cl.$$

The calculated electro-motive force of this cell is 0.65 volt.

In making these determinations of electro-motive force and current, a Western direct-reading voltmeter and milammeter were used. Resistance of voltmeter, 352 ohms; reading from 0.01 to 3.00 volts. The ammeter read from 0.01 to 2.00 amperes.

In all the experiments the gases used were but slightly above atmospheric pressure. Owing to limited time the author is not able to furnish data. Experiments to determine the many interesting questions involved are being conducted.

Mr. C. E. Timmerman, of Cornell University, who has assisted me, has taken great care, with the limited time at our disposal, to verify these results.

Interior Telephone Service in Boston.

The New England Telephone and Telegraph Company has about completed equipping every room in the new Hotel La Touraine, in Boston, with long-distance telephones, all of which are connected with the Hotel La Touraine central station. This system will work after the same order as the suburban stations of the New England Telephone and Telegraph Company, and any one wishing to talk with a guest can be connected directly with the room. The telephones will be operated on the common battery system; that is, there will be no battery at the same place as the telephone, but the operator will connect a large battery in the hotel basement with the telephone whenever the call bell is rung. The Hotel Brunswick is now being equipped with a similar system, and will have 240 telephones in all, while 70 telephones have been placed in the Hotel Vendome.

Jordan, Marsh & Company have a complete telephone system throughout their building, having 40 interior telephones, which were installed by the New England Telephone Company. Among the large Boston business houses which are liberal patrons of the New England Telephone Company are the Boston Rubber Shoe Company, subscribing for 35 telephones; Cobb, Bates & Yerxa, 38 telephones; North River Packing Company, between 20 and 30, and the Boston & Maine Railroad, 60 telephones.

FIG. 4.—TRACK CONSTRUCTION AT BROAD AND MEETING STREETS, CHARLESTON, S. C.

Tackling the Invisible.

[*From the Washington Star.*]

"I don't believe in anything I can't see," said the young man who aims to be considered a skeptic.

The middle-aged man with overalls on looked at him pensively for a moment, and then inquired:

"Young feller, did you ever ketch hold of a 'lectric wire?"

ELECTRIC RAILWAY NOTES.

An effort is being made at Skowhegan, Me., by a syndicate of local capitalists to get control of the stock of the Skowhegan & Norridgewock Electric Railroad.

A Saginaw, Mich., court, in charge of a street railway company in that city, has ordered the receivers of the company to sell "labor" tickets at the rate of nine for 25 cents, making fares to laboring people a good deal less than three cents a ride.

The war is still on between the Olean & Bradford, N. Y., Electric Company and the Olean Street Railway Company. The former will build an independent line through the city, and it is rumored that there will be a three-cent rate within the city limits.

The report of the Herkimer, Mohawk, Ilion & Frankfort, N. Y., Electric Railroad Company shows the following:

	1897.	1896.
Gross earnings	$9,753	$11,239
Operating expenses	5,019	8,158
Net earnings	4,734	3,081
Fixed earnings	2,452	2,126
Net income	2,282	955

The deputy commissioner of public works of Chicago, Ill., has issued a permit to the South Side Rapid Transit Company to lay a third rail along its elevated structure for the purpose of changing the motive power of the road from steam to electricity.

The annual report of the Stillwater & Mechanicsville, N. Y., Street Railway Company shows: Gross earnings, $12,665; operating expenses, $7,702; net earnings, $4,963; other income, $225; fixed charges, $4,186; net income, $1,002; total surplus, $490. The number of passengers carried during the year was 141,976.

The directors of the Framingham, Mass., Union Street Railway Company have issued a circular to the stockholders, in which they state that it is proposed to equip the Saxonville division of that road with electricity at the earliest possible moment. Recently the Framingham Center division was changed from horse to electric power.

C. R. Gether, of Whitefish Bay, Wis., has transferred his franchises, track and all his interests in the Whitefish Bay Street Railway to the Milwaukee Electric Railway and Light Company, which will proceed at once to connect the line with the Oakland avenue extension, with the intention of having both in operation by June 1, 1898.

It is reported that by the latter part of October the North and West Chicago street railroad companies will expend $1,500,000 in building new electric lines and remodeling old ones. Nearly 60 miles of double track will be added to the present systems. The steel rails required for the work will come to near 8,000 tons, and there will be used about 50 miles.

The Staten Island, N. Y., Electric Railroad Company has opened a new line from Port Richmond to Bull's Head. The road is about three miles long and was built in 10 days. The last rail was laid at 9 o'clock P. M., on August 21, and an illuminated car filled with Staten Island officials was run over the line. Along the entire route the citizens greeted the opening of the line with displays of fireworks.

The Fallsburg & Monticello, N. Y., Railroad Company has been given permisston by the Railroad Commission to construct an electric road from the station of the New York, Ontario & Western Railroad at Fallsburg to the station of the Monticello, Port Jervis & New York Railroad at Fallsburg. The commission has also authorized the Oneonta & Otsego Valley Railroad Company to operate its road by electricity.

Messrs. M. and J. Head, of the East Liverpool, Frederickstown & Lisbon, W. Va., Electric Railway Company, have purchased options on property leading into East Liverpool, and are making an arrangement for a terminal at that place. It is proposed to build a passenger and freight line to be operated by electricity from East Liverpool, connecting with the Erie and B. & O. at Lisbon and Niles. The right of way has been secured, and it is announced that grading will begin within six weeks. The company is capitalized at $500,000.

John B. Hoefgen has brought suit against the East Liverpool & Wellsville, Ohio, Street Railway Company, Albert L. Johnson, Sidney H. Short, C. E. Grover, L. A. Russell, W. B. Bolton, H. J. Davies and W. J. McDale, for $206,790.80. The plaintiff says that by the foreclosure of mortgages against the railroad company he came into possession of 249 $1,000 bonds. He says he has realized only $79,630.20 from the sale of them. He wants the other defendants, as stockholders, to pay the difference with interest amounting to $37,350.

ELECTRIC LIGHT FLASHES.

Henderson, Minn., has authorized an issue of $5,000 electric light plant bonds.

The citizens of Anderson, Minn., have voted in favor of issuing bonds for an electric light plant.

Huntington, Tenn., has authorized issuing $16,000 bonds for the purpose of constructing a water and electric light plant.

Richmond, Mich., recently voted against issuing $9,000 electric light bonds. The question will be brought up again later.

Dyersburg, Tenn., will soon hold an election to vote on the question of issuing $40,000 of bonds for the construction of a water and electric light plant.

At Confluence, Pa., an election will soon be held to vote on issuing bonds for the construction of a waterworks and the purchase of an electric light plant.

The municipality of Madison, Fla., is contemplating the issuance of bonds to cover the cost of electric light plant construction.

The Phenix, R. I., Electric Light and Coal Company has again changed hands, this time going to the Industrial Trust Company, of Providence, which held a $50,000 claim on it.

The Petersburg, Ind., electric light plant was wrecked by an explosion a few days ago. The boiler had been left for the night and the cause of the explosion is not known. The loss on the plant is $10,000.

The citizens of Rockville Centre, L. I., have decided to adopt electricity instead of gas for public illuminating purposes, and it is probable that an electric lighting plant will be installed at that place this Fall.

The stocks and bonds of the Chatham, N. Y., Electric Light, Heat and Power Company have been sold to Mr. J. M. Klingelsmith, who already owns the controlling interest in the electric light plant at Lee, Mass.

The Portsmouth, Va., Light and Water Company has filed a deed of trust to the Farmers' Loan and Trust Company, trustee, to secure consolidated first mortgage bonds. Total issued, $500,000; dated July 1, 1897.

The citizens of Mullica Hill, N. J., have decided to form a company to furnish electric light to the town and its citizens. The shares have been fixed at $10 each, and about $3,000 have been subscribed. They propose to begin the plant as soon as $5,000 is paid in.

Hannibal, Mo., by an overwhelming majority, has voted to issue $8,000 bonds to increase its electric light plant. At a meeting of councils to be held on September 6 details, rate of interest, and maturity will be decided on. The securities will likely be four and one-half per cent 10 and 20 year bonds, but not due at Hannibal.

The Edison Illuminating Company of St. Louis has defaulted in the payment of the interest on a $4,000,000 mortgage on its property, and the plant is to be sold under foreclosure proceedings on September 11. The holders of 3,977 shares have signed an agreement for the reorganization of the company on a plan favored by the Street Railroad and Illuminating Properties Company, of Boston. The largest stockholder, James Gamble, who owns 57 shares of stock, is opposed to the reorganization, and applied to Justice Dickey, in the Supreme Court, in Brooklyn, last week for an order to stay the sale under foreclosure. He alleged that the directors had appropriated $1,365,000 of the funds for fictitious improvements, part of which money ought to have been used to pay the interest on the mortgage. Justice Dickey denied the application on the ground that the Knickerbocker Trust Company, the trustee, had a right to sell the property under foreclosure, and that as the reorganization plan was perfected, interference with it would be disastrous, and the injury incalculable. There was no proof that the plaintiff had been tricked or defrauded.

TELEPHONE NEWS AND COMMENT.

The Three Rivers, Mich., Telephone Company has issued $10,000 worth of stock.

The Michigan Bell Telephone Company is reported to have given a chattel and real estate mortgage for $750,000.

The Bell Telephone Company, in Atlanta, Ga., has instituted suits against non-subscribing users of their telephones.

The Home Telephone and Telegraph Company, of Fort Wayne, Ind., has one telephone for every 35 inhabitants of that city.

Mr. Geo. W. Beers, of Fort Wayne, Ind., who is largely interested in independent telephone properties, spent last week in New York city.

Mr. J. E. Keelyn, president of the Western Telephone Construction Company, of Chicago, visited New York city the early part of last week.

The Blaine, Ky., and Louisa Telephone Company at a recent meeting elected the following officers for the ensuing year: H. H. Gambill, president; H. C. Osborn, secretary; J. F. Ratcliff, treasurer.

The Southern Bell Telephone Company has been refused a franchise at Hampton, Va., for the installation of an exchange. Hampton at the present time has an independent company with 180 subscribers.

Mr. Smith, of Smith & Patterson, New York, American agents for the Erickson telephone, sailed on Saturday last for Sweden, to confer with the parent company relative to the growth of their American business.

The Bell Telephone Company, of Rochester, N. Y., is threatened with a suit for damages, arising out of the injuries received about a month ago by Philip Gable, a cartman. Gable received a severe shock of electricity by handling a telephone wire that had fallen into a pasture lot, and he is now confined in St. Mary's Hospital suffering from injuries received on that occasion.

The decision of Judge Nathan P. Goff, of the United States Circuit Court, was handed down at Richmond, Va., on August 25, perpetuating the injunction against the city in favor of the local Bell telephone company. Judge Goff several months ago restrained the city by injunction from removing the poles and wires of the company from the streets in Richmond when the franchise had expired. The grounds upon which the telephone company fought the city was that their system was a part of the interstate commerce system of a general telegraph.

A CURIOUS ALTERNATE-CURRENT ARC PHENOMENON.

BY ALFRED HAY, B.SC., EDINBURGH, IN THE LONDON "ELECTRICIAN."

In the course of some experiments on alternate-current arcs between metallic electrodes, the following remarkable phenomenon was observed: It may be mentioned, in passing, that the maintenance of an alternate-current arc between metallic electrodes is an extremely difficult matter—a fact which does not appear to be very generally known. It is impossible to maintain the arc steadily; indeed, without special precautions it is quite impossible even to start it. If iron electrodes be used, they become red-hot for a considerable distance on each side of the arc while the latter continues burning. When this high temperature has been reached the arc generally goes out, and it will be found impossible to re-establish it while the electrodes are at a red heat. If now a jet of hydrogen be directed into the space between the two electrodes (Fig. 1) while their ends are at a bright-red heat, the following curious effect takes place. The smooth, well rounded surface of each electrode becomes contorted, and from its middle there arises a tentacle or process which gradually swells and advances to meet its fellow (Figs. 2 and 3). As soon as the two processes have come within a very short distance of each other (if not into actual contact), the arc is suddenly re-established, and the protruding portions of the electrodes are instantly withdrawn, the ends of the rods assuming a rounded shape (Fig. 1). The arc plays between them only for a second or two, and then goes out. The same phenomenon then occurs again, fantastically shaped prominences forming on the electrodes and slowly advancing towards each other until the establishment of the arc once more beats them back, flattening them as by a sudden blow. The shape assumed by the swelling incandescent masses varies a great deal, some of the more characteristic shapes being shown in Figs. 2 to 5.

We thus obtain an intermittent alternating arc between the electrodes. The arc generally lasts only a second or two, and the growth of the processes takes from three to five seconds. If the temperature of the electrode extremities falls below a certain limit, their growth ceases, and no further action takes place. It is therefore necessary to maintain the electrodes at a certain minimum distance from each other, in order that the phenomenon may take place regularly. On the other hand, if the distance be made very small, there is a tendency to form a complete bridge of incandescent material between the electrodes, which interferes with the action just described. When properly adjusted, the arc may be made to go out and re-establish itself more than 20 times in succession without requiring any feed. Should the arc go out permanently, the phenomenon may be started again by bringing the electrodes into contact and then separating them.

No effect of this kind takes place when the hydrogen jet is removed. The glowing ends of the electrodes do not in that case exhibit the faintest tendency to approach each other. The phenomenon therefore depends on the fact of an atmosphere of incandescent hydrogen surrounding the tips of the electrodes. Coal gas was also tried instead of hydrogen, but, although it was possible to obtain the effect, the necessary adjustments were much more troublesome, and even when at its best, the result was not nearly so well marked, nor capable of such sustained action as with a hydrogen jet.

The iron rods used in these experiments were about 11 millimetres in diameter, the arc was from three millimetres to five millimetres long, and took a current of 16 amperes at a potential difference of somewhere about 30 volts. The current was

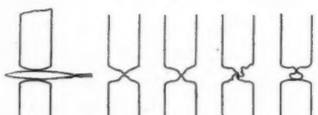

FIG. 1. FIG. 2. FIG. 3. FIG. 4. FIG. 5.

DIAGRAMS ILLUSTRATING A CURIOUS ALTERNATE-CURRENT PHENOMENON.

supplied by a Pyke & Harris inductor alternator, whose exciting current was such that the maximum value of the electro-motive force (i. e., the peak of the wave) on open circuit was about 350 volts.

If the switch be opened immediately after an extinction of the arc, the incandescent tips of the electrodes will still swell and approach each other, so that this effect does not depend on the feeble electro-static action exerted between them. On allowing the rods to cool, and examining the crusts forming their extremities, these will be found to consist of highly porous masses, thoroughly honeycombed in every direction. This shows that the upheaval and swelling of the electrode ends are due to small bubbles of gas which permeate the incandescent mass and become imprisoned within it. The sudden flattening of the electrode tips when the arc is established may be ascribed to mechanical action, due to the sudden generation of heat.

The effect may also be obtained with copper electrodes. An alternating arc having been established between two rods of copper (12 millimetres in diameter, the arc taking about 22 amperes at 40 volts), and maintained until small incandescent masses make their appearance at the ends of the electrodes, a jet of hydrogen is directed into the arc. As soon as the arc goes out, the little masses of incandescent material shoot out thin processes which approach each other and re-establish the arc. In the case of copper, however, the extinction and re-establishment of the arc are extremely rapid, each of these operations taking less than one second. Further, owing to the superior thermal conductivity of the metal, the cooling of the ends is so rapid that it becomes difficult to obtain more than four or five consecutive extinctions and re-appearances of the arc, after which the latter goes out permanently. In carrying out the above experiments, I have been assisted by Mr. H. D. Johnston, a senior student of University College, Liverpool.

LITERARY.

Walter A. Wyckoff, in the second part of his remarkable narrative, "The Workers," published in *Scribner's Magazine* for September, reaches West Point, where he is engaged shoveling the débris of the old Academic Building into a cart. The many nationalities employed on the job give a chance for close observation of the present conditions of unskilled labor. Mr. Wykoff's narrative has the charm of a story, combined with insight of the most serious social problems of the day.

"The Induction Coil in Practical Work, Including Roentgen X Rays," by Lewis Wright. Cloth, 172 pp., 72 illustrations and four plates. Price, $1.25. Sent, postage free, on receipt of price, by ELECTRICAL REVIEW Publishing Company, 4 Park Row, New York city.

This volume is a distinctly practical assistant to the experimenter in the safe and efficient use of induction coils. Workers in radiography, especially physicians and surgeons, will find many hints of value between the covers of this book. There is a special chapter on the Roentgen rays, the others relating to induction, discharges in partial vacua, spectrum work, discharges in high vacua, and miscellaneous experiments.

Maxim Produces a New Incandescent Lamp.

A recent cable dispatch from London states that Hiram Maxim, the American inventor and scientist, who is now making his home in England, has invented a new incandescent lamp, which promises to be an important step in advance, provided the cabled report is true. The filament is composed of a mineral substance instead of a vegetable fiber. The nature of the material used in the filament is said to be a secret. Mr. Maxim is quoted as describing the lamp as follows: It has a life of 1,000 hours, which is well maintained. The watts per candle-power are said to be two and eight-tenths. The cost of new filaments is said to be about one-tenth of a cent each.

Mr. Joel Hurt, who organized and has since been at the head of the Consolidated Street Railway Company, which owns the bulk of the surface lines in Atlanta, Ga., has resigned the presidency of the company. His resignation has been accepted. Mr. Hurt's retirement is purely voluntary. It is not known who will be his successor.

American Electric Railway Engineers in England.

[*From the London Electrical Review.*]

One of the daily newspapers is our authority for the statement that Sir A. B. Forwood has resigned the chairmanship of the Liverpool City Council tramways committee because of an adverse vote in regard to the committee's proposal to engage an American engineer for carrying out and supervising the work on the experimental trolley line section to be shortly equipped. If this be the case, we think that the Liverpool City Council has shown a good deal of common sense and fairness. No reasonable Englishman wishes for the days of protection to return, and we are as strong free traders as any one could wish to be; but when there are engineers in this country of professional standing, such as Professor Kennedy or Dr. Hopkinson, and manufacturers of world-wide repute, we don't need to go across the Atlantic for a consulting engineer who shall be capable of carrying out a complete electric tramway system. There are many directions, as, for instance, the design and manufacture of tramcar motors and controllers, in which we acknowledge American supremacy, and in these we are glad to avail ourselves of Brother Jonathan's experience (of course, paying for it), but to call in a consultant from the other side is rather too much of a good thing. The Dingley tariff is hardly likely to encourage the average Englishman to shower benefits unnecessarily upon America. Of course, we have not a word to say against the elect of Liverpool's tramway committee; far from that, for Mr. Pearson (we understand it is he) must have by now acquired such a mass of traction experience as few others possess. Yet it must be remembered that his skill and knowledge deal with conditions as they are found across the Atlantic, and these are not by any means necessarily the same as rule at Liverpool or elsewhere in this country. Apart from that, however, we protest against the committee asking for powers to engage Mr. Pearson as an expert, if only on the ground that there are competent Englishmen ready to undertake the work, and in overruling this proposal of the committee, the City Council is to be congratulated. We are surprised that the chairman of the committee should have taken such a course as that of resignation, a step of this kind savors too much of pique, which ought hardly to enter into an important municipal question. In any case, it should not be regarded as a marked want of confidence for the council to reject a part of the committee's proposal, especially when patriotism is the cause. For the council to give way now would put it in the position of yielding against its better judgment, in order to avoid unpleasantness.

Mr. A. E. Astruck, general manager of the Electric Arc Light Company, of New York, is absent from the city on a Summer vacation.

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ASSOCIATE EDITOR:
STEPHEN L. COLES.

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WESTERN OFFICE:
CARL E. KAMMEYER, Representative,
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LONDON OFFICE:
HENRY W. HALL, Representative,
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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, SEPT. 1, 1897.

CONTENTS.

	PAGE
Views, News and Interviews	97
The Charleston, S. C., City Railway Company	97
The Phœnix Carbon Manufacturing Company	98
On Some New Forms of Gas Batteries and a New Carbon-Consuming Battery	99
Interior Telephone Service in Boston	99
Tackling the Invisible	99
Electric Railway Notes	100
Electric Light Flashes	100
Telephone News and Comment	100
A Curious Alternate-Current Arc Phenomenon	101
Literary	101
Maxim Produces a New Incandescent Lamp	101
American Electric Railway Engineers in England	101
Street Railway Traffic	102
Western News Notes	103
Underground Electric Traction in New York City	103
Armorite in New York	103
Imperial Porcelain	103
A Big Power Installation in Montana	103
The Miller-Knoblock Company	103
Bell Taxes in Ohio	103
Saved a Lineman's Life	103
An Electric Heater Decision	103
Profitable Extensions of Electricity Supply Stations	104
The Willyoung Laboratory Burned Out	105
Obituary	105
A New Flush Switch	105
A Valuable Telephone Catalogue	105
Mr. Woodruff's High-Candle-Power Waistcoats	105
Death of Mr. Lozier	105
General Notes	105
Electricity on Steam Railroads	105
Professor Thomson, the Liquid Air and the Mystified Cook	106
Personal	106
A Growing Electrical Supply House	106
Coming Conventions	106
Electric Cabs in London	106
Special Factory Motors	107
dvance Information	108
Kindred Interests	ix
Electrical Patents	x
A Remarkable Car-Window Picture	x

INDEX OF ADVERTISERS.

COVER PAGES.	PAGE
Abendroth & Root Mfg. Co., boilers	xvi
American Electrical Works, insulated wire	i
Armorite Interior Conduit Co	ii
Babcock & Wilcox Co	xvi
Bristol Co., recording voltmeters, etc	i
Bunnell & Co., J. H., dry batteries	i
C & C Electric Co	xv, xvi
Clonbrock Steam Boiler Co	xvi
Columbia Incandescent Lamp Co	i
Crefeld Electrical Works	i
Crocker-Wheeler Electric Co	i
Day's Kerite, insulated wire	i, viii
Electric Appliance Co., supplies	i
Hampson, E. P., & Co., engines	xvi
Imperial Porcelain Works	xvi
Iron Clad Rheostat Co	i
Leffel & Co., Jas	xvi
McKenney & Waterbury	i
National India Rubber Co	i
New York Insulated Wire Co., Grimshaw wires and cables	i
Okonite Co., insulated wires and cables	i, xvi
Partridge Carbon Co., motor and generator brushes	i
Rodrigues, M. R	i
Standard Underground Cable Co	i
Stirling Co., water-tube boilers	xvi
Tabor & Mayer	i
Thayer & Co	i
Van Nuis, C. S	i

INSIDE PAGES.	
American Bell Telephone Co	xiii
American Electric Telephone Co., long-distance telephones	xiii
Andrews-Ryan Co., telephone engineers	xiii
Armorite Interior Conduit Co	xi
Automatic Circuit Breaker Co	xiv
Baker & Co., platinum	xiv
Berlin Iron Bridge Co	iv
Bernstein Electric Co., incandescent lamps	vii
Bids Wanted	ix
"Big Four" R. R	xi
Brill, J. G., Co	xiv
Brixey, W. R., Day's kerite wires and cables	viii
Carborundum Co	iv
Central Electric Co., electrical supplies	iii
Connecticut Pipe Mfg. Co	xiv
Correspondence School of Technology	viii
Diehl Manufacturing Co	iii
Dixie Company	x
Dixon, Jos., Crucible Co., belt dressing	xi
Dominion Co	ix
Duval, E. S., Jr., patents	x
Dyer & Driscoll, patent solicitors	x
Eastern Electric Cable Co	iv
Electric Storage Battery Co	iii
Electrical Mercantile Agency	xi
Empire China Works, porcelain specialties	xiv
Eppenger & Russell Co., Valentine subway electrical conduit	xiv
Eyanson & Armpriester	vi
Faraday Carbon Co., carbons	iv
Farr Telephone & Construction Supply Co	xiii
Forest City Electric Co	v
For Sale—Machine shop	xii
Fort Wayne Electric Corporation	vi
General Electric Co	v
Gordon-Burnham Battery Co	xi
Hemingray Glass Co	viii
Howard, J. H	vi
India Rubber and Gutta Percha Insulating Co	iv
International Correspondence Schools	ix
Jewell Belting Co	vi
Keystone Electrical Instrument Co	viii
Lehigh Valley Creosoting Co., creosoted lumber	x
Lockwood Long-Distance Telephone & Telegraph Co. of America	xiii
Lombard Water-Wheel Governor Co	xi
Lynn Incandescent Lamp Co	viii
Marshall, Wm., condensers	xi
McCaskey & Holcomb Co	ix
McIntire, C., Co	xi
McLennan & Co., commutator compound	viii
New England Engineering Co	xi
Newton Appliance Co	v
New York Telephone Co	ix
Novelty Electric Co., supplies	xiv
Ostrander, W. R., & Co., supplies	xi
Pacific Electric Co	x
Paiste, H. T., Co	xi
Partrick & Carter Co., electrical supplies for housework	x
Phillips Insulated Wire Co., wire	viii
Phœnix Carbon Mfg. Co	vii
Reisinger, Hugo	viii
Ritchie, E. S., & Sons	vi
Royce & Marean, electrical supplies	xi
Safety Insulated Wire and Cable Co	iv
Schiff, Jordan & Co	xiv
Siemens & Halske Electric Co. of America	xii
Solar Carbon & Mfg. Co	xiii
Standard Thermometer & Electric Co	v
Stanley Electric & Mfg. Co	xii
Sterling Supply & Mfg. Co	xiv
Viaduct Mfg. Co., telephones, etc	xi
Wabash Railroad Co	x
Wedderburn, John, & Co., patents	x
Western Electric Co	iv
Western Telephone Construction Co	xiii
Westinghouse Electric & Mfg. Co	vi
Weston Electrical Instrument Co., measuring instruments	viii
White & Co., J. G., engineers and contractors	x
Willard Battery Co., storage batteries	x

The recent unusual accident that stopped the running of the electric light station at Paterson, N. J., brought to every citizen of that place a prompt realization of the city's dependence on the electric current. The electric lights disappeared, the electric cars stopped running, and business houses had to close up for lack of illumination. Such accidents are rare, and are becoming less and less likely, and teach to all electric managers a lesson as to their responsibility to the public.

A Chicago paper states that that city is losing thousands of dollars a month owing to alleged sharp practice on the part of the various street railway companies. It seems that the city levies a license fee on each car in service, which is regulated by the number of trips per day for each car. The newspaper in question alleges that by juggling with the records of the trips it is made to appear that less than 500 cars are doing the service of the 2,000 or 3,000 cars in use. As the whole matter is regulated by city ordinances, it seems hardly possible the street railway companies of that city would jeopardize their standing by ignoring the law.

In the present issue of the ELECTRICAL REVIEW will be found an interesting paper read before the British Association for the Advancement of Science, by Mr. Willard E. Case, of Auburn, N. Y. The paper deals with Mr. Case's latest experiments in the matter of gas batteries. An interesting feature brought out by the author is that by his latest processes carbon is completely oxidized at normal temperatures to carbon dioxide. Mr. Case is endeavoring, as a final result, to oxidize carbon with the oxygen of the air at ordinary temperature. Its oxidization with the oxygen of the water is another step in advance. When this great result can be obtained with the oxygen of the air, it is believed that we shall get about 10 times as much energy from a pound of coal as we now get.

We had begun to hope that the silly season of 1897 would complete its cycle without the usual cry against microbes in the telephone transmitter. The daily papers are taking the matter up again and are creating considerable discussion over it. The danger of infection in the telephone transmitter, unless from some virulent disease, is so small as to be almost negligible. In New York city every part of the 17,000 telephone stations in service is thoroughly cleaned at least once a month and sometimes oftener. The records of the New York Telephone Company contain no mention of any of their inspectors having acquired diseases from being brought in contact with the transmitter microbe. It would seem that these men are more exposed to such dangers than any other class of people, and we would consequently look among them for the first indications of microbe diseases. Such, however, is not the case. More people are killed every day by falling from the roofs of 10 story buildings than acquire diseases through the telephone transmitter.

STREET RAILWAY TRAFFIC.

The figures relating to street railway traffic in and around several of the large cities of this country are, in some instances, almost beyond comprehension. The rate of growth in modern street railway traffic over the days of the horse car is truly wonderful. For instance, during the period from 1871 to 1896, the population of New York city has about doubled. In the meantime the street railway traffic of the city has increased from 129,971,000 to 526,192,663. In 1872 the elevated railroads of New York city carried 167,000 passengers, while in 1896 184,703,636 passengers traveled over these lines. The growth of street railway traffic has been especially marked in Massachusetts during the last 10 years, due almost wholly to the thorough use of electric power in that territory. In 1887, for instance, the total number of passengers carried on the street railways of that State was, in round numbers, 124,000,000. According to the report of the State Railroad Commissioners, the number carried last year was 297,000,000. The average number of passengers per trip has increased from 44 to 69. Further figures show that the net earnings of the street railways in Massachusetts have more than quadrupled in the last decade. The cost of riding on street railway cars has considerably decreased during the period of electrical development. The dollar that would buy 100 miles of street railway transportation 10 years ago will now carry a passenger 338 miles. Taking the matter all in all, the man who rides on the street car to-day probably secures more for a given amount of money than he could by spending the same sum in any other way.

We congratulate Lord Kelvin on the excellent opportunity he will have, while in the United States, to investigate the latest developments in all lines of electrical work. He will doubtless see many works to interest him, which have sprung up and been created since his last previous visit to these shores 13 years ago. It is remarkable that a man, such as Lord Kelvin, who has lived and worked in the same fields of scientific research for more than 50 years, should live to see the wonderful advances made by practical men during that time.

The French customs authorities have found a drawback to the use of X-rays as a detector of smuggled goods. In examining the baggage of tourists, many photographic plates and films have been ruined by exposure to the rays. A way must now be discovered to prevent the destruction of these articles of baggage.

WESTERN NEWS NOTES.

The American Electric Telephone Company, Chicago, is busy filling some large orders for its excellent apparatus, that is fast becoming known as standard among the independent telephone users. Several improvements in details have recently been made, the company being always on the alert for anything that will simplify the apparatus or increase its efficiency. Its new switchboard is a model in points of compactness and efficiency.

The Upton long-burning "Midget" lamp in its original form, adapted to burn singly on 110 volts, has proved to be such a success that several modifications of it have been designed, including the "Midget" long-burning lamp, to burn two in series on 220 volts, a lamp to burn five in series on 500 to 550 volts, and a high-tension series lamp to burn on series arc circuits of from four and one-half to seven amperes. All of these lamps are giving remarkable results, and having a very large sale. The "Midget" lamp is one of the Electric Appliance Company's specialties, and they are pushing it with their usual energy.

K. McLennan & Co., Chicago, manufacturers of the famous Gales' commutator compound, announce an important reduction in the price of this necessary adjunct to every well operated station. This step was decided upon to meet about the only objection that could have been urged against the compound; i. e., its price. From and after September 1, the price will be 50 cents per stick or $5 per dozen, and it is confidently expected that this will induce all to send for a sample who have heretofore been deterred from using it. The compound is warmly indorsed by some of the largest central station men, and is undoubtedly the best on the market.

The Western Telephone Construction Company is busier than ever, and has its full force at work completing orders for the various exchanges recently closed for. Among the large number, we notice the following: Gordon Telephone Company, Piedmont, W. Va., 100 telephones and switchboard; Great Falls, Mont., 200 telephones and switchboard; Southern Illinois Telephone Company, Effingham, Ill., 50 instruments; Interstate Telephone Company, Edgemont, S. D., 50-drop board; Mt. Vernon Telephone and Message Company, Mt. Vernon, N. Y., 200-drop switchboard; Spartansburg, S. C., 300-drop board, 200 telephones; Dublin, Ga., 100-drop board, 75 telephones; Wrightsville, Ga., 50-drop board, 10 telephones; Citizens' Telephone Company, Florence, Ala., 100-drop board, 100 telephones; Sheridan Telephone Company, Sheridan, Wyo., 100-drop switchboard, 35 telephones; Phœnixville, Pa., 100-line board, 50 instruments; Burlington, Ia., Mississippi Valley Telephone Company, 300-drop board, with 300 instruments.

Chicago, August 28. C. E. K.

Underground Electric Traction in New York City.

Mr. John D. Crimmins is quoted as follows with regard to the use of electric power on the Metropolitan street railway lines in New York city:

"We are pushing the work to completion with the utmost rapidity. The motive power decided on for the future is electricity. Compressed air will not be used. An immense power plant is being erected on the East River from Ninety-fifth to Ninety-sixth streets. We shall have the biggest electrical manufacturing plant in the world, and its machinery will supply motive power for all our lines. There are 212 miles in the system, 39 miles of cable and electric road, leaving 183 miles of horse-car line to be changed to the new system, with expensive steel rails, harveyized steel plate crossings and substantial underground trolley conduits."

Work is well advanced on the Fourth avenue line. The company expects to spend $12,500,000 in installing the new system. More than 4,000 men are at work daily on the job. In addition to the Fourth avenue line, the underground trolley is also being put in on the Fifty-ninth street, Twenty-third street, Amsterdam avenue and Second avenue lines of the Metropolitan Traction Company. The greater part of the work, it is believed, will have been completed by November 1. The Fourth and Park avenue line will be opened through to the Harlem River by that time, unless there is some delay in the construction of the new city sewer at Ninety-fourth street.

Armorite in New York.

Last week the Electrical Bureau of the New York City Fire Department approved the use of Armorite interior conduit, and it may now be installed by architects and contractors in all buildings under the jurisdiction of the fire department. Considering the unusually large number of new buildings that are now being erected in New York city, a splendid market is at once afforded to the Armorite Interior Conduit Company, of Pittsburgh, whose new manufacturing plant at Second avenue and Brady street, in that city, is splendidly equipped for filling orders of any size for armorite. The company has also established New York headquarters at 711 Havemeyer Building, and within a few days will be fully prepared to supply New York city orders from New York stock.

Imperial Porcelain.

C. S. Knowles, of Boston and New York, general agent for "Imperial" porcelain insulators, manufactured by the Imperial Porcelain Works, of Trenton, N. J., has issued a very handsome booklet printed in two colors, giving full details and illustrations of the various types of insulators made by this well known firm. The booklet will be of interest to any one interested in high-potential electric transmission.

A Big Power Installation in Montana.

A site has been selected for the proposed dam on the Big Hole River, at which point will be erected a $500,000 electrical generating plant to transmit current to Butte, Mont. It is expected that the plant will be completed by next February.

The power-house will be located at the present site of the old bridge crossing the Big Hole River. It will be 212 feet long, with a steel smoke stack 150 feet in height. It will contain 13 turbine wheels, probably of the James Leffel pattern. Owing to the fact that the water supply fluctuates during the year, a vertical compound condensing engine, with the necessary boilers to supply steam, will also be installed to avoid all risks. The engine, however, will not be needed more than a month or two in the year, and perhaps not at all. The turbines will be coupled direct to the generators. The dam, which will be built on the Big Hole River four miles from Divide, will be 60 feet high, built of solid masonry. The penstocks will be 10 feet in diameter. It is expected to transmit 6,000 horse-power to Butte, at a loss of 10 per cent in transmission.

The Miller-Knoblock Company.

The Miller-Knoblock Company, South Bend, Ind., whose electric street sprinkling cars are well known, is adding to its already large business an electrical department, which will be under the direct supervision of Mr. A. W. Morrell, an experienced electrical engineer and constructor, who has had years of experience in street railway motor work. It is the intention of the company to manufacture and carry in stock, ready to ship at a moment's notice, Morrell's improved assembled motor commutators for street railway motors. The fact that street railway men can procure assembled commutators for any and all standard street railway motors will be appreciated. They will also carry in stock armature coils for all the standard motors. A complete equipment for the rewinding of armatures has been put in. Mr. Morrell, who has charge of the electrical department, has had long experience in electric street railway work, and is well known at St. Louis, Minneapolis, Indianapolis and Cleveland, where he has had charge at different times of important works.

Bell Taxes in Ohio.

There was a rumor current last week that the American Bell Telephone Company is to be assessed $90,000 annually in the State of Ohio, as result of action of the State Board of Equalization. It is not unlikely that an effort will be made to assess back taxes, in which case an additional $355,000 will be asked for. The company has no property excepting instruments in Ohio, for which it receives an annual income of $14 each, and has refused to pay taxes upon income.

Saved a Lineman's Life.

[From the Worcester, Mass., Gazette.]

Eugene Welch, a lineman employed by the Springfield Electric Light Company, escaped a terrible death, yesterday morning, while at work near the top of one of the tallest poles in that city. He was on the 65-foot pole in the rear of the Republican Building, about 10.30 o'clock, with two other men, Ralph Sanborn, a foreman, and Charles Allen, a lineman. The other two men were on the cross-piece above, drawing up another cross-piece, and Welch was on the "T" bar beneath, winding a wire. In some way his left shoulder hit a live wire, and his right hand, coming in contact with the wire he was winding, the current of at least 1,000 volts was short-circuited and passed through his body. He gave a scream and became insensible, but the wires and the prompt action of his fellow-linemen prevented him from falling to the pavement below. The men pulled him from the wires by main force, and then their work was only begun.

The problem was to get the insensible man to the ground, but the men accomplished the feat in safety, and by the time it was done people were beginning to realize that something was the matter. After getting the man from the wires, the linemen held the body and pulled up the cross-bar. The rope was then put about the body of the insensible man and Sanborn, supporting the body from beneath, slowly went down the pole, while Allen dealt out the rope from his lofty perch. It was a bit of prompt, level-headed work on the part of Welch's fellows, and to them, in a way, he owes his life. If he had been alone upon the pole he would have been "roasted alive," in the terse expression of a lineman, or else he would have fallen to the hard pavement below. The patrol wagon was called and the man was taken to his room at the Mansion House. It was found that his left shoulder and right hand were badly burned. The burns are serious, and it will be some time before Welch can get to work again.

An Electric Heater Decision.

On August 25, Judge Putnam, of the United States Circuit Court for the District of Massachusetts, rendered a decision in favor of the complainant, with an order for an injunction and accounting, in the suit of the Consolidated Car-Heating Company, of Albany, N. Y., against the American Electric Heating Corporation and the West End Street Railway Company, of Boston, Mass. This is the suit for the infringement of the patent to James F. McElroy, covering the Consolidated Car-Heating Company's spiral coil construction of electric heaters, which is now in use on the majority of street cars operating electric heaters in this country. It is considered a most important victory.

Mr. T. C. Wood, of the Ball & Wood Company, New York city, sailed for Europe last week.

PROFITABLE EXTENSIONS OF ELECTRICITY SUPPLY STATIONS

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, NIAGARA FALLS, N. Y., JUNE, 1897, BY ARTHUR WRIGHT.

Perhaps it may seem rather bold for an Englishman to write a paper on a subject relating to the working of central supply stations in a country from which we all acknowledge came the first real impetus to practical electricity supply; but it occurred to the author that by so doing the managers of some of the American stations, in discussing the conclusions which experience has led the author to believe are sound, might throw some fresh light on one of the most vital questions we all have to meet.

If, owing to his ignorance of the special conditions and difficulties under which electricity has to be supplied on the continent of America, he has made some mistakes of detail, the author trusts the members will overlook them, so long as they do not vitally affect the main principles, on which their criticism is earnestly invited.

There are many central stations which, very soon after starting the supply, have to face extensions of plant and mains, and generally such necessity for extensions has been regarded as an unmistakable proof of commercial success. That this is not necessarily so, many of us have found, as it is obvious that no extensions are warrantable unless a definite profit can be assured from them.

No company should be called upon to supply electricity to any one at a loss, notwithstanding the common impression that it is necessary in electricity supply business to take the bad customers with the good, and the author hopes to show in this paper that it is quite possible to devise a simple and equitable tariff by which a profit to the supply company, as nearly as is commercially practicable, is assured from every consumer; and, moreover, that only by adopting such a tariff of approximately *equal rates of profit* from all consumers can central station managers hope to get the use of electricity generally adopted for all the purposes it naturally lends itself to.

The author also hopes to show that it is not only possible, but extremely easy, to do an enormously extended business in electricity supply in such a way as to yield substantial profits to the supply company, and at the same time to supply electricity to an ever-increasing number of consumers at rates which will insure large business, and in most cases to successfully compete with gas.

Hitherto the main governing idea among central station managers seems to have been that electricity must rely upon its superiority as regards cleanliness, convenience and healthiness over its competitors for lighting purposes. The author hopes to convince the members that, in one of the richest fields open to central supply stations, electricity can compete with its rivals, even as regards price.

UNRECOGNIZED PROFITABLE FIELD FOR LARGE EXTENSIONS.

Owing to the enormous development of the business of electricity supply for power transmission, for traction and other purposes, many central station managers have lately devoted most of their energies to the supply of electricity for those uses, and have apparently assumed that they have already substantially secured the greater part of the lighting business they are likely to get in their districts. The author, on the contrary, firmly believes that there exists even a larger and more profitable field for electricity supply ready at hand in every town, waiting only to be tapped, and refers to the supply of light to the thousands of domestic lamps required by the middle classes in their homes, which are used regularly every day for several hours, Summer and Winter, and which, in many cases, can be replaced by electricity at the same price, or even less than the light now used, and at the same time yield substantial profit to the supply company.

This profitable domestic supply, which is largely used after business hours, need in no way interfere with the much-catered-for power supply, the value of which the author fully appreciates.

Another enormous field for profitable extensions is to be found in the smaller and lower classes of stores, saloons and business houses that trade until late in the evening. As these classes of consumers frequently live over their business premises, their use of artificial light is a very lengthy one; although their bills may be small, they form a most desirable class of possible consumers, and can be supplied at a rate that, although low enough to secure the business, will yet yield such a substantial profit as to far more than counterbalance the extra cost of connection and collection to such classes.

Central station managers are now seeking fresh markets and uses for electricity supply, neglecting the domestic lighting field, which has hardly yet been touched. This, the author considers, is mainly due to the habit that they have generally acquired, of regarding consumers collectively instead of individually, and estimating the cost of supplying any one class to be the average cost of supplying all classes, thereby overlooking that it is quite possible that more profit may be derived from the supply of electricity to small long-hour consumers at a low rate than from the supply of large consumers, such as extensive stores, at a much higher rate.

IMPORTANCE OF THE TARIFF QUESTION.

The author doubts the possibility of much financial success attending the efforts of central station managers until they dismiss from their minds the idea that large consumers' bills necessarily mean large profits, as very frequently the reverse is the case. Although it seems a mere platitude to say that a small business with a large profit is better than a large business with a small profit, yet this would not appear to have been generally realized, if we are to judge by the great inducements frequently given in the matter of discounts off heavy bills to consumers, irrespective of whether the conditions under which their electricity has been supplied have yielded a profit or a loss, while very little inducement, if any, has been offered to the small consumer, who requires light for long hours, in order to tempt him to use electricity for lighting purposes.

The author trusts it will not be imagined that, because he has expressed such a keen appreciation of the small long-hour consumer, he does not appreciate the large consumer having the same qualification. His contention is that, if an equal rate of profit be charged to all consumers of every class and size, the field for profitable extension is practically boundless.

In this paper the writer has tried to confine himself solely to the commercial considerations which govern the profitable extension of supply stations, he being firmly of the opinion that, while engineers have been devoting vast energy and time to considerations of coal and plant economy, they have neglected the easiest of all means for reducing the cost of supplying the electricity; viz., the adjusting of the charges so as to offer great inducements to the profit-yielding consumers and to charge as high a rate as possible to the unprofitable ones; this will assuredly broaden out the average load curve of the station and increase the usefulness of the investment. Although in large stations the question of coal economy comes almost next in importance to that of the necessity for absolute reliability of supply, the paramount consideration must always be the arranging of the tariff so as to attract the most profitable classes of consumers. The raw materials of electricity supply—viz., coal, water and stores—have in many stations been brought down to a little over one cent per kilowatt hour, and all the resources of engineering, so far as we now know them, can only help us to make a fractional improvement on that small figure.

EFFECTS OF VARIOUS METHODS OF CHARGING.

It may be argued that if the principle of equal rates of profit from all consumers be carried into effect, it might result in a serious loss of revenue to the supply stations, owing to the large but short-hour consumers objecting to the higher rates thereby necessarily charged to them. In practice, this need not be feared, as consumers of that type are generally either unable to dispense with electricity or are in sufficiently good positions to be able to afford to pay comparatively a high price for the luxury of having the best light procurable for a short time per day, or at irregular intervals. Moreover, any consumer discontinuing his supply for the reason that he was charged at a higher rate than his neighbors, would not necessarily be a loss to the supply company, as, unless he is a source of profit, the plant allocated to his wants could be better employed; in fact, it certainly would be greatly to the advantage of many stations having a uniform rate of charge if they were to disconnect some of their large short-hour consumers instead of increasing their capital in order to extend their plant.

A perfect answer to these short-hour consumers, who object to pay a higher rate than their long-hour neighbors, is that under no circumstances whatever ought their supply to involve a loss to the supply company or increase the charge on the more profitable classes, as it is obviously very sound commercial practice in every business, without exception, to encourage the profitable, even at the risk of losing some of the profitless, business.

American central station managers were among the first to recognize that the cost of supplying a given quantity of electricy depends, in nearly every case, far more on the time over which the supply is spread than on the quantity taken, and early saw the commercial unsoundness of indiscriminately supplying all consumers at the same fixed rate per lamp hour or kilowatt hour, regardless of the varying lengths of time over which the supply was spread; but they, with many others, have been deterred from changing their method of charging by the doubt as to whether a more equitable one could be successfully carried out in practice.

If it be theoretically sound that the cost of supplying electricity generally depends chiefly on the length of time the necessary plant and mains are used, it seems an obvious corollary that the charge for the supply should conform to the same law. The author hopes to show that this theoretically correct principle can be successfully carried out in practice to the great advantage of both the supply stations and the general public. He moreover contends that it is impossible for a general supply to be given at so low an average cost or price on any uniform basis of charge as it can be on an equitable sliding-scale tariff, as a uniform price necessitates the long-hour, or profit-yielding, consumers having to make up to the company the loss incurred in supplying the short-hour consumers; this must tend very greatly to limit the use of electricity by the long-hour consumers, and, further, to bring to the station a large and undesirable class, who are thereby enabled to get their supply at less than its cost, and surely means placing quite an unnecessary and unwise limit to the lowering of the price at which electricity can be profitably supplied.

If the principle of a sliding scale based upon the more or less prolonged use of the maximum demand is correct, then, on every consideration of practice and of policy, it should be applied to each consumer without distinction.

Uniform rates mean that, if high, they discourage the only class of business yielding profit; and if low, mean a heavy loss on supplying short-hour consumers, which they directly encourage. Moreover, a uniform rate can never be so low for the supply of electricity to long-hour consumers as charges on an equitable sliding-scale system.

The author hopes to prove, by the figures given later, that a uniform charge for electricity limits its use to the classes, and that it is only by the system of making the charges follow the same law as the costs that the masses can be reached. This limiting of the use of electricity to the select few is still more aggravated by the prevalent, but highly pernicious, system of only giving substantial discounts to large consumers, irrespective of their manner of consumption.

One would think, to judge from the load curves of many of the central stations charging on the uniform price system and giving discounts in proportion to the amount of the consumer's bill, that nine-tenths of the population went to bed about eight o'clock in the evening, or, in any case, did not require artificial light after that hour; yet the amount of light required from then until 11 or 12 P. M. must be immense, and, being a prolonged load on the central station, would be taken under the most favorable conditions for cheap supply. As a matter of fact, in such towns it will be generally found that consumers pay two lighting bills—one for electricity, which, by reason of the high uniform rate of charge, only is used in the short-hour lamps in conspicuous places, and another for gas or other illuminants, which are used in the long-hour burners, by reason of their lower price—yet the actual conditions under which these different lights are produced and supplied favor quite the reverse.

It is important to bear in mind that gas is considered good enough in a considerable proportion of the situations where artificial light is required, and competition with it, in such positions, must be on the basis of cost. The public freely admit that electric lighting is necessary for living rooms, offices, shops, theaters and restaurants, but with electrical energy at a uniform price, or other form of restrictive tariff, they are apt to remain satisfied

with gas in corridors, kitchens, bedrooms, girls' workrooms, etc.

Although there are very few men who, having studied the question of the cost of supplying electricity, will now deny that this has to be provided and delivered under essentially different conditions from those appertaining to the supply of commodities, such as gas and water, yet it is not by any means so generally recognized as the author thinks it must ultimately be, if the use of electricity is to become equally general, that these great differences in the methods of production and supply are so radical that they necessitate entirely different methods of charge.

Taking the cases of gas and electricity supply: In the former, owing to the low cost and efficiency of gas storage reservoirs, it may be taken as nearly correct that one consumer taking the same quantity of gas per annum that another does, but at quite a different maximum rate, will cost the gas company practically the same amount; whereas, with electricity, owing to the greater cost of, and unavoidable loss in, storage batteries, compared to the cost of a boiler and steam dynamo plant of equal maximum output, it can be shown that a kilowatt hour, consumed in, say, half an hour, may quite possibly cost the company nearly 10 times as much as if the same consumption had been spread over 10 hours in the same day, owing to the capital outlay and standing charges being so enormously greater in the first case compared with the second. Now the author challenges any one to prove that it can be either equitable or even commercially expedient to charge for these two equal quantities of electricity at the same rate per kilowatt hour. Moreover, he asserts most emphatically that, unless the charges for these equal quantities vary in about the same ratio as their respective costs, the supply companies are seriously discouraging their very best consumers and actively encouraging the most undesirable class they can have, and so long as the many-hour user of light is expected to pay the cost of keeping plant standing idle for other people, so long will he stick to gas if he is in a small way, or prefer an isolated plant if he is wealthy.

(To be continued.)

The Willyoung Laboratory Burned Out.

About 11 A. M. on August 24 the building at 904–906 Nassau street, Philadelphia, was practically destroyed by fire, with a loss of about $3,000, and insurance of $2,500. The building was occupied by Elmer G. Willyoung & Company as a branch shop, in which were also located the drawing rooms, photographic room, experimental laboratory, and a glass-blowing department. The building was used principally for manufacturing induction coils and X-ray apparatus. Twenty-four hours after the fire the company had secured new quarters and work was going on as before. The company informs us that the delay in filling orders will not be over three or four days at the outside.

The Western Electric Company, Chicago, has issued the second of its advertising pictures. This one represents a Roman battle, and is designed to illustrate the strife of competition and to prove that the Western Electric Company is the great electrical supply center.

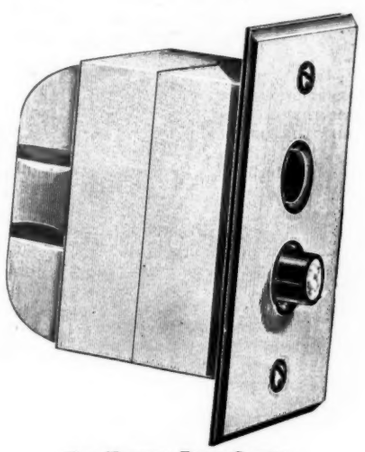
OBITUARY.

Ed L. French, for the past year engaged as general salesman and expert for the American Electric Telephone Company, died at Toledo, on the 14th ult., his death being the result of an accident met with while at Put-in-Bay. Mr. French had been engaged in the electric light and telephone business for several years past, and was a young man of unusual promise and sterling qualities. His loss will be felt keenly by a host of friends, as well as his relatives. He died at the age of 25 years.

A New Flush Switch.

A new flush switch, known as the "Newton," is being introduced to the construction field by the Newton Appliance Company, 120 Liberty street, New York.

The switch is of first-class workmanship and has a simple, positive movement, and has the indorsement of the electrical bureau. The accompanying illustration shows the general appearance. It is now being placed in the new Astoria Hotel, which will, electrically, be the finest equipped hotel in America; also in the new Columbia College buildings and many others.



THE NEWTON FLUSH SWITCH.

A Valuable Telephone Catalogue.

The new catalogue No. 4, just issued by the Farr Telephone and Construction Company, 342 Dearborn street, Chicago, is so complete and full of valuable information, that all users and intending purchasers should send for a copy, if they do not already possess one. It contains, in addition to a full line of modern telephone instruments and accessories, a complete price list of all kinds of electrical supplies, profusely illustrated, and contains only standard and reliable goods.

Mr. Woodruff's High Candle-Power Waistcoats.

[From the New York Evening Sun.]

No wonder Chief Electrician Martin, of Brooklyn, was anxious when he heard that Lieutenant-Governor Woodruff was to be among the spectators of the fountain display last night. That statesman's Summer waistcoats are of higher candle-power than any other ornamental thing that was ever devised.

Death of A. M. Lozier.

Arthur de la Montagnie Lozier, son of Jennie de la M. Lozier, M. D., Dean of the New York Medical College and Hospital for Women, died of typhoid fever, on August 26, at the residence of his sister, Mrs. S. H. Payne, New Brighton, S. I. Mr. Lozier was born in Orange, N. J., in 1874, and was a graduate of the Stevens Institute of Technology in the class of '94, taking the degree of M. E. He was at the time of his death assistant manager of the Bullock Electric Company, of New York city. He was a member of the American Institute of Electrical Engineers, and a chief signalman on the non-commissioned staff of the First Naval Battalion.

The funeral services, which were held at Christ Church, New Brighton, S. I., on Sunday last, were attended by many of Mr. Lozier's friends, including his old classmates and members of the American Institute of Electrical Engineers and the New York Naval Militia.

GENERAL NOTES.

The contract for equipping the vaults of the United States Treasury, at Washington, D. C., with electric burglar alarms, has been awarded by Treasurer Robertson to the Home Electric Protective Company, of New York.

An Albany dispatch says that the case of the Consolidated Car Heating Company against the West End Street Railway Company and the American Electric Heating Corporation, for infringements of its electric car heaters, has been decided against the West End and American companies.

Under the will of the late Henry L. Pierce, of Boston, five institutions will receive $750,000 each as residuary legatees. Among the five is the Massachusetts Institute of Technology, of Boston. The money will probably be used to increase the general facilities of the institute, which have been of late very cramped.

In an attachment case last week, where the plaintiff lived in Cincinnati and the defendant in New York city, the facts of the affidavit were telephoned from Cincinnati to Joseph G. Deane, in New York, to get out the attachment. Using the telephone for this purpose has come to be quite a common proceeding. The plaintiff and his attorney stood at the telephone in Cincinnati, while Mr. Deane was at this end. The plaintiff declared that he was the plaintiff. Mr. Deane read over the facts as he put them in the affidavit, and the plaintiff made oath to them.

The New Jersey Legislature passed a law last Winter which was intended to compel the Consolidated Traction Company to run vestibule cars on its lines during the Winter months. The wording of the act was such that the requirement was for the Summer instead of Winter. At the last meeting of the Jersey City Police Board, a resolution was adopted directing the Chief of Police to enforce the law. Lawyer James B. Vredenburg, for the Traction company, has served notice on the Police Board that an application will be made to Supreme Court Justice Lippincott, for a rule to show cause why the resolution of the board should not be taken to the Supreme Court for review on a writ of certiorari. It will be contended that the law is defective and unconstitutional.

Electricity On Steam Railroads.

TO THE EDITOR OF ELECTRICAL REVIEW:

The railroads have been very slow in appreciating the advantages which would accrue both to their earnings and to the comfort of their passengers by the introduction of electricity. The electric surface roads have been cutting into the business of our home roads in all directions, and yet these have made no steps whatever to meet this competition by the introduction of electricity upon their own roads. Years ago legislation had to be resorted to to compel the roads to adopt the Westinghouse air-brake; and to stop the unbearable nuisance of the noises made at night in the freight yards along the lines of our various roads, similar relief may have to be resorted to. To use a coarse phrase, those who are unfortunate to be anywhere near the tracks of a railroad, where freight trains are made up or freight cars moved at night, know that "all hell let loose" is quietude compared with the noises attending these maneuvers. There will undoubtedly be at some future time an agitation to compel the roads to use electricity in the place of the noisy, nasty, dirty steam, and this agitation will begin in connection with the making up of freight trains and moving freight cars at night. To wait for the railroads to abate the nuisance is childish.

There will soon be a great development in the use of electricity in all directions. One of the most significant signs which has been brought to my notice of late is the shipment of two large cargoes of electrical machinery to South Africa, which is to be utilized in a vast plant at Johannesburg to work the mines in that district. If this experiment should prove successful, as it no doubt will, it will lead to similar large plants being utilized in this country for mining purposes.

Respectfully yours,
HERBERT RADCLYFFE.

Boston, August 18.

Professor Thomson, the Liquid Air and the Mystified Cook.

A local paper in Lynn, Mass., recently printed this story: A small party of prominent electricians, among whom were Prof. Elihu Thomson, John W. Gibboney and Walter C. Fish, of Lynn, with Edwin W. Rice, Jr., formerly superintendent of the Thomson-Houston Electric Company, of this city, but now technical director of the General Electric Company at Schenectady, N. Y., and a few outsiders, sat down to a quiet supper in the private dining room of Earl & Martin's restaurant on Union street, when some of the wits in the party amused themselves by playing tricks on the table attendants, and also on the astute cook, William J. Bond, by freezing some of the dishes solid, as soon as the latter were put on the table. In fact to such an extent did one member of the party carry his merriment that he sent back a slice of bread, solidly congealed, to the cook, with an interrogation as to why such food was put upon the table. "Billy" was naturally puzzled at the occurrence, and all the more so when he too examined the bread complained of, and found it crumbled into dust at his touch. He could not solve the enigma and was still further puzzled when a glass of liquid was returned, also frozen solid. One of the electricians gave the secret away after the supper, and explained that the substances were frozen by means of liquid air, of which one of the party had a supply.

PERSONAL.

President E. M. Barton, of the Western Electric Company, visited New York city last week.

Mr. C. S. Bradley, the well known inventor, sailed for Europe last week, and expects to be away two months.

Hon. James D. Reid, the "grand old man" of the telegraph, has been relieved as American consul at Dunfermline, Scotland, and it is likly he will return to America before Winter.

During the recent meeting of the British Association for the Advancement of Science, in Toronto, Trinity University conferred honorary degrees on Sir John Evans, Lord Lister, Lord Kelvin, Prof. James Bryce, and Sir George Scott Robertson, the hero of Chitral.

Prof. E. G. Acheson, president of the Carborundum Company, was knocked down and robbed in the street near his home at Niagara Falls, N. Y., last Friday night. The thief got Professor Acheson's watch and damaged his countenance considerably. His many friends will hope that Professor Acheson's injuries are not serious.

A press dispatch from Cleveland, Ohio, dated August 28, states that plans are on foot for the building of a big street railway system in Cleveland in opposition to the consolidated lines. Most of the capital will be furnished by New York capitalists. Everything has been conducted with the utmost secrecy thus far. Mayor R. E. McKisson is said to be interested in the project.

A Growing Electrical Supply House.

Some years ago a young man started, in a small way, an electrical supply house in a basement in one of Philadelphia's side streets. The ELECTRICAL REVIEW presents herewith an illustration from a photograph of the present establishment of Frank H. Stewart & Company, at 35 North Seventh street, which shows how "large trees from little acorns grow." The company occupy almost the entire ground floor—with other storage facilities—of this building, which is in the heart of the electrical and mechanical locality of Philadelphia. During the past three years of depression, the increase of the business of this house, owing to the judicious management of Mr. Stewart, has been in contrast to the surrounding conditions, and much of their success has been due to the excellent class of patronage, which the firm are well able to hold.

INTERIOR VIEW IN THE PHILADELPHIA ELECTRICAL SUPPLY HOUSE OF FRANK H. STEWART & COMPANY.

President Strain Charged with Embezzlement.

Robert F. Strain, president of the United Telegram Company, was arrested in Boston on Monday of this week, charged with the embezzlement of $73,000 from the company. He was arrested at the instance of William H. Baker, vice-president of the Postal Telegraph company, of New York.

Coming Conventions.

The annual meeting of the Association of Edison Illuminating Companies will be held at the Cataract House, Niagara Falls, N. Y., on September 14, 15 and 16.

The New York State Street Railway Association will also hold its annual meeting at Niagara Falls on September 14.

Superintendent Martin, of the New York and Brooklyn Bridge, says that electricity gives 25 per cent more capacity for passengers than did the cable system. The new electrical plant for the bridge is about completed.

Electric Cabs in London.

The London Electrical Cab Company was formed nine months ago to construct hackney vehicles propelled by electricity to ply for hire in the streets of London. At first sight it might appear that the use of accumulators in connection with these vehicles would prove no more successful than the use of accumulators in the propelling of tramcars, which, up to the present date, can hardly be described as successful commercially, although their reliability leaves nothing to be desired, says London *Engineering*. There is, however, a very great difference in the use of accumulators of these two types on vehicles.

Owing to the small space available on an electric tramcar for the storage of the cells, the proportional weight of the cells to the total weight of the vehicle is comparatively small, say, as for example, in the case of the accumulator cars run by the Birmingham Central Tramway Company, the weight of the accumulators is two and one-half tons, out of a total weight of about 13 tons, including passengers.

In the case of an electrical cab, such as those put into service by the London Electrical Cab Company, the accumulators weigh upwards of 1,400 pounds, out of a total weight, including passengers, of, say, 3,000 pounds.

The beneficial effect of this difference can not be over-estimated, for, while the cells on an electrical tramcar running under the above conditions are being almost continuously discharged at a higher rate than that normal for the cells—and with a consequent rapid deterioration of the cells—the cells on the electrical cabs are being usually discharged under the normal rate of discharge, and, with the arrangements adopted, even in ascending moderate inclines, the normal discharge rate of the cells is not exceeded; and it is only when ascending severe gradients, such as those leading into Waterloo station, that the normal discharge rate of the cells is exceeded, and then only by a comparatively small amount.

Early experiments made by the company to determine the energy required to propel the road vehicle on solid rubber tires disclosed the fact that the tractive effort on wooden pavements barely exceeds that of a tramcar running on rails, and even on an ordinary macadamized road the energy taken is not much greater. When, however, the thick mud, such as that met with only in the country, is encountered, the tractive effort is very considerably increased; and this company, therefore, whilst maintaining that it is perfectly practicable to run electrical vehicles in the streets of London or other well paved and comparatively level towns with commercial success, do not suggest that the same holds good of vehicles to be used on country roads.

The battery used on each of the vehicles consists of a set of 40-E. P. S. traction type cells having a capacity of 170 ampere hours when discharged at a rate of 30 amperes.

These cells are all mounted in one tray, which is slung under the bottom of the cab by four suspension links supported by springs under compression, and the ordinary carriage springs again separate the cells from the vibration to which the carriage wheels are exposed.

It being considered that one of the sources of expenditure in the maintenance of traction cells is the amount of pulling about they are usually subjected to in taking them in and out of the vehicles, the cabs have been designed so as to entirely prevent any such damage occurring in their case.

The cabs are placed over a hydraulic table on to which the tray of cells is wheeled on a light skeleton iron trolley. The table is then raised until the tray comes into the position in which it can be attached to the suspending links. The hydraulic table with the trolley is then lowered, and the cab left free to propel itself away.

When the cells are to be changed, the cab is propelled over the hydraulic table, and the reverse operation takes place. The electrical mechanical equipment on each cab consists of a three horse-power Johnson–Lundell motor with a double-wound armature and double-wound fields. The series parallel controller by which the connections between the windings of the armature and fields are manipulated, and countershaft to which the motor is geared, and which, in its turn, drives the two driving wheels of the cab through endless chains. As the two wheels are driven by the one motor, it was essential to adopt a differential gear of the "jack-in-the-box" type to connect the two halves of the countershaft together. This gear has been ingeniously arranged within the gear wheel, driven by the motor pinion, and forms a very compact arrangement. The chain connecting the countershaft with the driving wheels are of Hans Renold's latest laminated type, dispensing entirely with the usual sprocket arrangement, and running on the pinion and chain wheel with the same side play as a belt, thus wearing the chain evenly, and enabling it to be used with the same efficiency as when new until completely worn out.

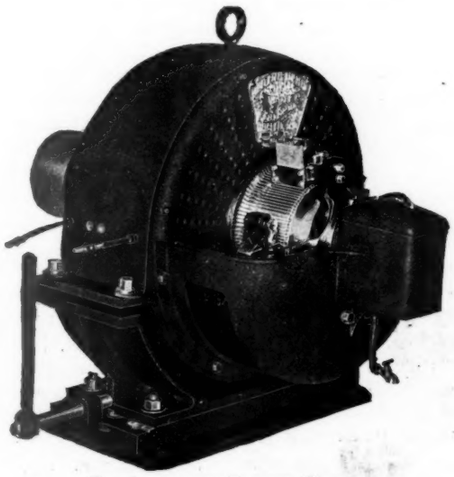


FIG. 1.—SPECIAL FACTORY MOTOR.

The double-wound motor and series parallel controller is perhaps the most important arrangement on the cab, insuring, as it does, the greatest economy in the consumption of current at whatever speed the cab may be running.

The controller is arranged so as on the first step to connect on two armature windings and the two field windings of any series with a small starting resistance; this is not a running speed, but is only intended to start the motor into motion. On the second step the windings are still in series, but the resistance cut out, and with this arrangement the cab runs at a speed of about three miles an hour. The third step places the armatures in parallel, but leaves the fields in series, and with this arrangement the cab runs at about seven miles an hour. The fourth step places the field windings in parallel, and the cab runs nine miles an hour. It will thus be seen that three normal running speeds allow of the full energy of the current being utilized in the motor without any absorption in resistance, and the cab can thus "crawl," using only about the same number of watts per car-mile as when running at full speed. In the reverse direction from the top position, the series parallel controller on the first step short-circuits the motor through the starting resistance, thereby gently braking the cab. On the second step backwards the motor is completely short-circuited, bringing the cab to a dead stop; and the third step backwards reverses the connections between the armatures and fields, all being in series to enable the cab to be moved at the slowest speed backwards. The whole of these movements are produced by the use of one lever placed at the side of the driver's box. The circuit from the accumulators to the controller and motor passes through an ingenious switch arrangement attached to the foot-brake, which can also be used for bringing the cab to a stop. This switch is arranged to break the circuit when the foot-brake is applied, and to brake it rapidly so that there is no injurious arcing at its contacts. It is, therefore, impossible in the use of either the electric or the foot-brake for a careless driver to apply the brake whilst the current is still passing through the motor. The foot-brake has another advantage in the crowded London streets, for when moving in a block the driver can set his controller handle to slow ahead, and then start and stop the cab time after time as the traffic slowly moves on by simply putting on and taking off his foot-brake.

It was originally estimated that two sets of cells would be required to enable the cab to do an ordinary day's work in the streets of London, it being considered that one set would propel it about 35 miles. The economy of the motor and controller arrangements, however, is so considerable that it is now found the cabs will do at least 50 miles with one set of cells, and the economy in the use of current thus experienced will make the running of the cabs cheaper than was originally expected. The company recognized that when its service becomes considerable it will require charging stations in several parts of London, and they, therefore, determined not to generate their own current for charging, but to purchase it as a day load from supply companies. In their first charging station at Juxon street, Lambeth, the current is received from the London Electric Supply Corporation at 2,400 volts alternating with a periodicity of 83 per second. To convert this into a continous current two alternating motor generators have been provided, each one with an output of 75 kilowatts on the secondary side. These machines consist of a British Thomson–Houston alternator coupled on the same bedplate to a continuous-current generator of the same make. The alternator is run up to speed by the cells which it is afterwards to charge put in step with the London Electric Supply Company's current, and the continuous-current field then strengthened until the requisite volts pressure is obtained for charging the cells. The transformation from high-pressure alternating to low-pressure continuous-current is thus effected without the use of any intermediate transformers with an efficiency of about 86 per cent. The Shoreditch Vestry have also entered into a contract with the company for the supply of current at its second charging station, which will probably be in the city at the price of 1½d. per unit.

The charging arrangements for the cells are very complete; a battery having been detached from the cab, in the manner previously described, is run on rails over the hydraulic lift by which it is elevated into the charging gallery above. The battery with its trolley is taken on a second trolley along the gallery into its proper charging position, where it is connected up to the two conductors through the low-tension supply. One of these conductors passes directly back to the charging switchboard through a regulating resistance and ammeter, the other conductor being attached to a common return. Each battery is therefore separately connected to the charging switchboard and the charging current regulated by its own regulating resistance switch. The cells on which these switches are mounted are also used for registering the time at which each battery is put on to the charging circuit and the rate at which it is being charged.

Special Factory Motors.

The rapidly growing demand for motors for machine shops and factories to drive tools and machinery of all kinds, and the confidence in their reliability and durability which has resulted from their successful use in the past, has created a call for special designs which will permit of their being put, without much additional cost, in out-of-the-way places so as to occupy little room and, if possible, no floor space at all. To meet this demand the Card Electric Company, of Mansfield, Ohio, has brought out the motor shown in the accompanying illustrations (known as their S Type), which can be set on the floor, or supported from a post or wall, or suspended from the ceiling.

Fig. 2 shows the motor with a bracket support for fastening to a post or wall. By changing the position of the armature bearings, i. e., turning them one-half round on the pole frame, the bracket will be brought above the motor, which will then hang down. When the driving belt is to run horizontally from the motor, or nearly so, this style of support is desirable, since the belt-tightening screw is in the best position for quick adjustment.

The style of base shown in Fig. 1 is adapted to support the motor on the floor, as shown in the cut, or by changing the position of the armature bearings, in order to keep the oil boxes right side up, from the wall or ceiling; and when the belt is to run nearly vertical this style of base is better than the bracket for wall support because of the better position of the belt-tightening screw. It is obvious that these motors can be used to drive shafting by gears as well as by belts when it is desirable to do so. As motors of this kind are frequently fastened to iron girders or posts in buildings, and therefore grounded, protection to the armature and field coils is provided for in the construction by heavy insulation between the pole frame and base. In all other ways care has been taken to insure rigidity and lasting qualities. These motors are made in sizes up to 15 horse-power.

FIG. 2.—SPECIAL FACTORY MOTOR WITH BRACKET SUPPORT.

ADVANCE INFORMATION

New Electric Railways.

NEW ORLEANS, LA.—The Carrollton Railroad Company has arranged to build its proposed extension in the city and suburbs. H. P. Dart is representative of the company.

NEW YORK, N. Y.—Empire Electrical Traction Company has been incorporated by William W. Doty, James A. MacKnight, Charles C. Granten, Joseph C. Granten, Charles J. Beckermann and William Reinhart, to manufacture electrical appliances. Capital stock, $100,000.

CLARKSVILLE, TENN.—A movement is on foot to construct an electric railway from this place to New Providence.

GAINESVILLE, GA.—An application has been made for charter to built a new street railroad for Gainesville.

SACO, ME.—The Saco River Electric Railroad has been granted permission to run its tracks through North and Elm streets.

EASTON, PA.—Work is about to commence on construction of new electric road from Easton to Bethlehem.

DENVER, COLO.—A two-mile trolley line is to be built between Pueblo and River View Cemetery.

TAMPA, FLA.—F. A. Solomonson and others have been granted permission to build and construct a street railway.

BALTIMORE, MD.—An electric railway will probably be constructed to connect Pen Mar with several Cumberland Valley resorts.

CUERO, TEX.—Mr. R. A. Pleasants has been granted a franchise over the streets of the city for a street-car line. The line is to be built within 12 months.

MORGANTON, N. C.—City Clerk may give information concerning construction of electric railway from that place to Blowing Rock.

CARROLLTON, MO.—F. B. Crouch is manager of a company which has been formed to construct an electric line.

PENSACOLA, FLA.—The Pensacola Electric and Terminal Railroad Company have applied for charter, with W. H. Northrop, president; A. C. Blount, Jr., vice-president, and D. W. Thom, secretary and treasurer, for building an electric line in Pensacola. Capital stock, $200,000.

TAMPA, FLA.—F. A. Solomonson and others have secured franchise to build an electric street railway from Tampa to Ybor City in the suburbs.

BOSTON, MASS.—Leonard A. Saville, of Lexington, is interested in the construction of proposed electric road from North Lexington to Arlington Heights.

WHEELING, W. Va.—The Wheeling & Elm Grove Railroad has awarded the contract for constructing the city end of the electric line to L. G. Hallock. The contract is to be completed by November 1. The city line is 2.35 miles in length, and extends from the corner of Fourteenth and Water streets to the bridge, from Peninsular into Fulton.

KANSAS CITY, MO. — The East Side Electric Railway Company has filed articles of incorporation at Jefferson City. The stockholders are Joseph Heim, Ferd. Heim, Michael Heim and C. S. Palmer, and the capital stock is $2,000. This will, according to Mr. Palmer, be increased as soon as a franchise is obtained from Kansas City. The purpose of the new company is to operate an electric line on East Fifth street, from Walnut street to Lydia avenue, north to Guinotte avenue, east to Otis avenue, which is within a block of Heim's brewery, and north again to Nicholson avenue.

QUAKERTOWN, PA.—C. Taylor Leland, president of the Quakertown Traction Company, states that the trolley line to Richland will be built this Summer, the contract having been awarded to J. A. Walker, of Philadelphia. The road is to be completed within 90 days.

Electric Light and Power.

OPELOUSAS, LA.—Sanders & Porter, Columbia Building, Louisville, Ky., will construct a waterworks and electric light plant, to cost $30,000.

GREENWOOD, S. C.—D. C. DuPre, Mayor, may give information concerning construction of electric light plant.

ELKIN, N. C.—The Elkin Manufacturing Company may be addressed concerning construction of electric light plant.

PHILADELPHIA, PA.—The Northern Electric Light and Power Company is to make an addition to its plant.

HURON, S. D.—The Huron Electric Light and Power Company has sold its plant to Harry S. Sterling, who will at once put in a perfect system. The new plant will be in operation within the next 30 days.

WILLIAMSTON, S. C.—The Williamston Oil and Fertilizer Company will install an electric light plant. They are in the market for same.

DELPHOS, OHIO—The council has taken the first steps toward putting in an electric light plant, to be owned by the corporation.

BREWTON, ALA.—Contracts have not yet been signed for the construction of the electric lighting and water plant at this place.

HOLLY SPRINGS, MISS.—The Mayor may be addressed concerning erection of electric light plant.

SILOAM SPRINGS, ARK.—A combination plant will be erected to furnish the city with water and public lights.

MOBILE, ALA.—The Electric Lighting Company, S. S. Rubira, president, is making arrangements to duplicate the present capacity of its plant, putting in new boilers of 500 horse-power, new engines of 400 horse-power, and five dynamos of the most approved style.

FORT SMITH, ARK.—Tom Ben Garrett, Mayor, may be addressed concerning lighting of streets with electricity.

BEEVILLE, TEX.—J. S. Sale and Victor H. Koos are interested in electric light system.

ABILENE, KAS.—City Clerk may give information concerning erection of electric light plant.

HENDERSON, MINN.—An electric light plant will be established.

WHARTON, TEX.—An electric light plant will be established.

MACON, MISS.—Mr. Harvey is putting in an electric light plant for the town.

MADISON, FLA.—The question of putting in an electric plant and building a $6,000 academy at this place has been settled, and the question now is whether the town shall be bonded for these enterprises. No doubt an election will be held soon to settle it.

SALT LAKE CITY, UTAH — The Union Light and Power Company has been incorporated, with a capital stock of $4,550,000. The directors are George Q. Cannon, Joseph F. Smith, John R. Winder, Frank J. Cannon, C. K. Bannister, W. J. Curtis, L. S. Hills, T. G. Webber, W. S. McCornick.

NEW BRIGHTON, PA.—The Beaver River Power Company has commenced the erection of an electric light plant on a plot of ground recently purchased in Fallston. The company recently applied for a charter. It is composed of Hon. S. P. White and eastern capitalists, and will furnish electric light for the entire valley.

SPRINGFIELD, TENN. — Electric lights are to be established here, it is reported.

NASHVILLE, TENN.—An electric light plant has been put in and is being operated by the Jellico Electric Light and Telephone Company, and the company is making preparations to put in a telephone exchange.

ANN ARBOR, MICH.—An electric light plant is being put in the university in all the buildings, including the hospitals, and also arc lights on the campus. The entire work will be done by the students of the university.

CROWLEY, LA.—P. J. Chappins, Mayor, may give information concerning construction of electric light plant.

SILVANIA SPRINGS, ARK. — An electric light power-house is to be constructed.

BALTIMORE, MD. — The Point Breeze Company will put in an electric plant of 5,000 lights in its new Casino Building, to be erected at Point Breeze.

COVINGTON, TENN.—John Craig contemplates putting in new electric light machinery.

PARK RAPIDS, MINN. — George Mandigo, who is behind our electric light system, has commenced work on the plant, and it is expected that the system will be in operation by September 15.

SCHENECTADY, N. Y.—The Hudson River Power and Transportation Company has secured permission to string wires and erect poles through the town of Halfmoon.

New Telephone and Telegraph Companies.

CHATTANOOGA, TENN. — A telephone line will probably be constructed between Dickson and Charlotte.

VERMILLION, S. D. — The telephone line from Sioux City here has become the property of the Northwestern Telephone Exchange Company, of Minneapolis, which will extend its line to Yankton and to Centerville. Vermillion will have communication with Minneapolis as soon as the line is completed from Sioux City to Elk Point.

CHIPPEWA FALLS, WIS. — E. Keelyn, of Evanston, Ill., has been granted a telephone franchise here. It will run to Eau Claire.

BALTIMORE, MD.—The Maryland Telephone Company has been incorporated by Claude M. Acklen, Ira H. Gaither, Chas. C. Richardson, R. B. Hazlett and Chas. E. Fink, for the purpose of manufacturing electrical apparatus and equipping lines for the use of telephones and other purposes. Capital stock, $200,000.

SUMMERVILLE, S. C.—The Southern Bell Telephone Company is about to build an exchange at Summerville, and put its subscribers in communication with Charleston. The work of putting up the poles, stringing the wires and putting the system in shape will be started in a week or two.

WESTFIELD, N. Y. — Westfield Telephone Company has been incorporated by Robert J. Morehead, Clayton J. Bannister, William Stokes, Fred W. Plate, Mark A. Caldwell and George H. Frost. Capital stock, $5,500.

New Incorporations.

NASHVILLE, TENN.—The Swarts Switchboard and Electric Company, of Knox County, has been incorporated by H. B. Branner, C. R. McCormick, Henry J. Swarts, W. S. Miller and W. H. Goss. Capital stock, $10,000.

HOBOKEN, N. J.—The "George Washington Manufacturing Company" has been incorporated to manufacture gas, petroleum and electricity for heating, illuminating and other purposes. Its capital stock will be $300,000. The incorporators are John C. McGuire, of Brooklyn; Paul Halpin, of New York, and Charles McKing, of Jersey City. Business will be begun in September.

SAN FRANCISCO, CAL.—The Follis Electric Corporation has been incorporated. The capital stock is $25,000, of which $5,000 has been subscribed by the following directors: James H. Follis, Harrison Brooks, John W. Brooks, Richard N. Follis and E. A. McInerney.

Increase of Capital.

CLEVELAND, OHIO—The Lorain & Cleveland Railway Company has increased its capital stock from $500,000 to $1,000,000.

CLEVELAND, OHIO—The Cleveland, Painesville & Eastern Railway Company has increased its capital stock from $500,000 to $1,000,000.

Kindred.... ...Interests

The agency for the Elden alternating circuit-breaker has been taken by L. A. Chase & Company, Fort Hill square, Boston.

A new line of switches, involving all the modern theories of switch work, is being put on the market by the Shawmut Fuse Wire Company, 93 Federal street, Boston.

The Jewell Belting Company, of Hartford, Ct., are enjoying a good demand for the well known Jewell brands of dynamo belt cement, dynamo belt dressing and their patent pulley covering.

The Bibber-White company, of Boston, have recently been made sole agents for New England of the Walker Company, and this progressive house plan to vigorously enter the street railway construction field.

The New York agency for the Hope Electric Company, of Providence, has been taken by Mr. Elmer Morris, well known in the electrical industry, and the Chicago representation for this company is in charge of Mr. S. F. B. Morse.

In another column will be found an advertisement asking for bids for furnishing arc lights to the city of Niagara Falls, N. Y., for a period of five years from November 1, 1896. Specifications for this work are on file with Mr. S. F. Arkush, City Clerk of Niagara Falls.

The managers of the Paragon Arc Lamp Company, of Boston, speak most encouragingly as to the outlook for manufacturers of arc lamps. Though this company are comparatively new in the field, their lamp has been accepted by experts, and its construction and excellent operation indorsed.

The L. E. Knott Apparatus Company, 14 Ashburton place, Boston, are still experimenting and developing X-ray apparatus. The machines made by this company are now in use by scores of physicians and experts, and many of the best improvements along these lines for the X-ray science are due to the laboratories of the Knott company.

The Albert & J. M. Anderson Manufacturing Company, of South Boston, Mass., in addition to their established street railway overhead equipment specialties, have developed a line of switches of several designs, and are doing a large amount of high-class switchboard work. They number among the list some of the finest switchboard equipments which have been installed in New England.

The Interior Conduit & Insulation Company, of New York, are preparing a new series of Lundell motors, which will run up in the higher units—as high as 100 kilowatts—which they expect to have before the electrical field late in the Fall. Anything bearing the name of "Lundell" is so fully accepted as standard throughout the mechanical world that these machines will be awaited with interest.

Probably the most compact push-button switch on the market is the F. & L. push flush switch, for which the Electric Appliance Company, of Chicago, are general selling agents. The face plate of this switch is no larger than an ordinary one-light gas key, and the switch operates on very much the same plan. It is easy to operate and perfectly sure in its results, and what is perhaps more important, is that it is low in price.

The Lynn Incandescent Lamp Company, of Lynn, Mass., the renewers of worn-out incandescent lamps, report continued activity during the heated season, and their new factory, with its special machinery, is now in perfect running order. Mr. E. F. Dwyer, the president of the company, mentioned to a representative of the ELECTRICAL REVIEW that a western factory was in contemplation, with the view of avoiding the long shipments of lamps, as the company are doing a large western business.

The old established manufacturers of incandescent lamps, the Bernstein Electric Company, Boston, during the past years of business depression, has more than maintained its high standard in the electrical field. The lamp product from the Bernstein factories is always accepted where the best in incandescent lighting is appreciated. Under the general supervision of Mr. James Bradley, president of the Bernstein Electric Company, the shops have been very active with a large complement of hands during the Summer season.

The success which the Cutter Electrical and Manufacturing Company, of Philadelphia, have had in the last year with the "I-T-E" circuit-breakers and controlling apparatus is a tribute to the designers and managers of this company. In no department of electrical construction work has more thought and experiment been concentrated than along these lines, and within a period of 12 months or so, perhaps 15 manufacturing companies have prepared apparatus of this nature, but even in view of this fact the Cutter specialties are in almost universal use.

General Manager Harrington, of the Electric Carriage and Wagon Company, of New York, a firm which has recently entered the field with an electrical carriage, in competition with the old-fashioned "cabby," says that the call for the novel vehicle keeps the entire 14, which they are now operating, in almost constant use. This is the first motor vehicle station established anywhere in the world, and it is being watched with much interest. The system involves the storage batteries of the accumulator type, made by the Electric Storage Battery Company, of Philadelphia, and one charge furnishes power for 20 running hours.

McCASKEY & HOLCOMB COMPANY,
CONTRACTORS
SPRINGFIELD, ILL.
415 COMMERCIAL BLDG., ST. LOUIS, MO.

We make a specialty of constructing Municipal Electric Lighting Plants.

Send for Estimates and Valuable Information.

The Mayor and Gas Committee will receive bids to light the City of Waco, on an all-night and also on a moonlight schedule, with 125 to 200 arc lights, 2,000 c.-p., for a term of two to five years. We will also receive bids to install an electric light plant, specifications for which will be furnished by City Engineer on demand. All bids must be accompanied by a $1,000 certified check. We reserve the right to reject any or all bids. The bids will be opened by the Mayor and Gas Committee at 3 P. M., October 7th, 1897.

C. C. McCULLOCH,
Mayor, Waco, Texas.

ATTEST:
R. W. JOBLONOWSKI,
City Secretary.

BIDS WANTED FOR ELECTRIC LIGHTING

ASHEVILLE, N. C., Aug. 12.

Bids for lighting our city are requested as follows:

For furnishing and maintaining one hundred to one hundred and fifty electric arc lights of two thousand (2,000) candle-power each.

The city reserves the right to reject any or all bids.

Bids to be received until September 20, 1897.

GEO. F. SCOTT,
Chairman Special Light Committee.

NOTICE TO BIDDERS.

Notice is hereby given that bids will be received by the Common Council of the City of Niagara Falls up to and including the first day of November, 1897, at 8 o'clock P. M., for the exclusive furnishing of electric arc lights to the City of Niagara Falls for a period of five years from November 1st, 1898, according to specifications on file with the City Clerk.

Each bid shall give the name and address of the bidder, and shall state the price per annum, for which the bidder will furnish each electric arc light of a two thousand (2,000) candle-lamp-power for said term.

The estimated number of arc lights to be furnished is three hundred (300), with the right of the Common Council of the said city to increase or decrease the said number as it may elect during said term.

The successful bidder will be required to enter into contract for the furnishing of said number of electric arc lights as may be required for such term at the price per annum named in its bid and to furnish bond in twenty thousand dollars ($20,000.00) for the faithful performance of said contract.

Each bidder must accompany his bid with a certified check for ten thousand dollars ($10,000.00) as a guarantee that he will enter into contract if the same is awarded to him.

Further information, if desired, will be furnished by the City Clerk upon application.

All bids shall be opened at the meeting of the Common Council to be held Monday, November 1, 1897.

The Common Council reserves the right to reject any or all bids.

Dated August 16, 1897.

By order of the Common Council.
S. F. ARKUSH, *City Clerk.*

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"The two most important discoveries in 1896 were Prof. Roentgen's X Ray and Thomas D. Hawley's Automatic System of Reasoning in 'Infallible Logic.'"

The book contains nearly 700 pages, bound in Full Law Sheep.

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[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED AUGUST 24, 1897.

588,591 Electric battery; William Mills, Elizabeth, N. J.—Consists of a containing cell having a cover, the annular zinc element, an insulating bushing detachably secured to the edge of said element, and a conducting rod secured to said element below the bushing and passing upwardly and outwardly through said bushing.

588,602 Dynamo electric machine; L. C. Rice, St. Louis, Mo.—In a dynamo electric machine or motor, a stationary armature, a stationary field magnet or magnets, a rotating inductor magnet having poles of opposite polarity magnetically insulated from each other, and a casing completely inclosing said armature, field magnet or magnets and inductor magnet, and forming part of the magnetic circuit.

588,610 Electric Arc Lamp; Thomas Spencer, Philadelphia, Pa.

588,669 Electric wick-lighting device; Henry Van Hoevenbergh, New York, N. Y.—The combination with a central draft lamp of a high resistance conductor adjacent to the upper end of the wick tube, an auxiliary wick or oil absorber adjacent to such conductor, and an electrical circuit in which the conductor is located.

588,683 Electric lighting system; F. W. Lord, Boston, Mass.—Consists of a two-way switch and a two way lamp socket connected at two corresponding points to the two-way switch, and connections from the third point on the socket and on the switch to the mains of the system.

588,685 Incandescent lighting substance; W. Mahler, New York, N. Y.—A mantle or hood for incandescent lighting composed of a large percentage of thorium oxid, a small percentage of cerium oxid, and a smaller percentage of lanthanum oxid.

588,686 Electric cut out; N. Marshall, Boston, Mass.

588,695 Electric burglar alarm; H. M. Dumas, Detroit, Mich.—The combination of a normally closed main circuit, normally open shunt in the guarded building, a door guard switch in the main circuit adapted to close the shunt, a branch of the main circuit around said guard switch, and a lock or switch outside the door for opening and closing said branch.

588,692 Armature for induction motors; A. L. Cushman, Concord, N. H.

588,771 Electric connection between rail way rails; Fort Marsellis, Peralta, Cal.—Consists of curved segmental conducting plates adapted to span the space between the rails, and having their opposite ends bent or curved to one side to form contact with the rail webs, and superposed fish plates with holding bolts, whereby the conducting plates are forced into contact with the rail webs.

588,791 Electric rail bond; W. B. Cleveland, Cleveland, Ohio—Consists of an oblong frame formed from a laterally compressed coil of flat wire coiled to have its flat sides bearing against each other and of terminal heads and lugs cast upon the doubled ends of said frame.

588,797 Electrical keg register; W. Kraft, Baltimore, Md.

588,822 Electric arc lamp; B. F. Greene, Sheridan, Pa.—The combination with a clutching ring of a sleeve having a mitered end engaging said clutching ring, and a swinging frame carrying an elbow lever to engage the ring, said swinging frame connected to an armature and dash pot to operate the clutching ring and automatically feed the carbon as required.

588,831 Electrical transmission of power; Emil Lanhoffer, Mulhausen, Germany.

588,880 Electrical indicator for valves; W. J. Rickard, Philadelphia, Pa.—Consists of a main conduit, a valve chamber connected therewith outside of the direct line of flow of fluid in said conduit, a nozzle having a cock connected with the conduit, a normally open electric circuit provided with an alarm, and a circuit closer therein in the outlet of said valve chamber controlling said alarm.

TREASURY DEPARTMENT, UNITED STATES Life-Saving Service, Washington, D. C., August 27, 1897.—Sealed proposals will be received at this office until two o'clock P. M., of Tuesday, September 7, 1897, for furnishing the Life-Saving Service 6,660 pounds of No. 10 Brown & Sharpe hard-drawn copper wire, and 350 wooden telephone poles. Specifications and full information can be had upon application to the Inspector of Life-Saving Stations, 24 State street, New York city; to the Superintendent of Telephone Lines, Life-Saving Service, Long Branch, New Jersey; or to this office. S. I. Kimball, General Superintendent.

A Remarkable Car-Window Picture.

The traveler into Canada who is so fortunate as to be a passenger on the Toronto, Hamilton & Buffalo Railway (the new Buffalo and Toronto line) will be rewarded by a view of a particularly interesting and beautiful scene, embracing mountain, valley and lake. It is to be seen, as you approach the city of Hamilton, near the village of Stony Creek, where the emerald waters of Lake Ontario suddenly burst into view from the mountain side, with the fertile and cultivated valley, many miles in extent, intervening. The road rapidly descends the mountain toward Hamilton, the magnificent sweep of country constantly unfolding, and the many tints of leaf and plant blending harmoniously with the ever-changing colors of the waters of the lake beyond. In this land and water picture the railway company has, almost without knowing it, perhaps, brought to the knowledge of the traveling public a mine of loveliness, impressing and attracting the eye of the layman and entrancing the vision of the artist. The scene bursts upon the traveler with electric suddenness, and, although remaining in view in constantly changing situations for a quarter of an hour as the road winds along its picturesque path down the mountain side, it departs all too quickly, leaving a mental impression at once delightful and imperishable.

COUNTERFEIT MILEAGE TICKETS.
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Recently there appeared in Pittsburgh a man giving the name of R. C. Lucas, accompanied by a woman calling herself May Anderson, who attempted to dispose of counterfeit B. & O. mileage books. They did succeed in selling some to the brokers, and then departed for Cleveland, where they registered at the American House as R. C. Lucas and wife.

In their efforts to dispose of the spurious tickets, they aroused suspicions, which were at once communicated to the B. & O. agent, who immediately took such action as led to the arrest and conviction of the woman, who was found guilty of selling counterfeit tickets, and sentenced to six months in the workhouse, and to pay a fine of $500 and costs.

The man succeeded in making his escape, but as he is known to the railroad people and the police, his arrest is only a question of time.

The B. & O. officials have taken every precaution to prevent the sale or use of these spurious tickets, and have expressed a determination to prosecute to the fullest extent of the law any one caught attempting to use counterfeit mileage or other bogus forms of transportation, and will be especially vigorous against brokers found offering them for sale.

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